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Newsletter of the
Faculty of Natural and
Agricultural Sciences

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UP ready to address challenges in agriculture for next hundred years

Not only did the Faculty of Natural and Agricultural Sciences at the University of Pretoria (UP) celebrate a **hundred years of agriculture** at a prestigious event on 7 November, but it also recognised Dr Johan van Zyl, former Vice-Chancellor and Principal of UP and current CEO of African Rainbow Capital as the UP Agriculturalist of the Century.

This year marks one hundred years of agricultural science at the University of Pretoria. A centenary celebration should not bring complacency; it gives us an opportunity to reflect on the past, take stock of the present and consider the future. We should formulate a vision for the future to reach our desired destination and set the foundation for the *...continues on page 3.*



Read more on meerkat behaviour on page 44.



Prof Jean Lubuma
Dean: Faculty of Natural and Agricultural Sciences

This has indeed been a year of celebrations for the Faculty of Natural and Agricultural Sciences, with the **Agricultural** component of the Faculty celebrating its centenary at a prestigious event on 7 November (page 1).

As always, we have much to boast about concerning the outstanding achievements of our staff members. **Prof Esté van Marle-Köster** of the Department of Animal and Wildlife Sciences was elected as president of the South African Society for Animal Science at the Society's 50th Congress, becoming the first woman in its history to hold the office (page 8). Two brilliant female researchers in the Department of Genetics, **Dr Vinet Coetzee** and **Dr Sanushka Naidoo**, made headlines when they were both selected as Next Einstein Forum (NEF) Fellows from 2017 to 2019 (page 6). **Prof Namrita Lall** of the Department of Plant and Soil Sciences and one of her PhD students, **Mrs Danielle Twilley**, were honoured with Biotech Fundi awards (page 25).

In April 2018, the first world conference on sorghum in over 30 years will be hosted jointly by the Feed the Future Innovation Lab for Collaborative Research on Sorghum, Millet of Kansas State University, USA, and the University of Pretoria (UP). **Prof John Taylor** and **Dr**

Message from the Dean

Janet Taylor of the Department of Consumer and Food Science will serve as chair and secretary respectively of the conference's South African organising committee (page 14).

Several high-profile appointments were made in the Faculty this year. **Prof Elna Buys** was appointed as Head of the newly merged Department of Consumer and Food Science (page 29), while **Prof Bernard Slippers** was appointed as Director of the Forestry and Agricultural Biotechnology Institute (page 30). **Prof Paulette Bloomer** was appointed Head of the newly merged Department of Biochemistry, Genetics and Microbiology (page 32), and **Prof Marietjie Potgieter** was reappointed as Deputy Dean for Teaching and Learning (page 31).

Through multidisciplinary research, as well as teaching and learning endeavours in the Faculty, we aim to make a difference in the world. As part of an international collaboration, innovative research was conducted by **Dr Pieter Olivier** from the Department of Zoology and Entomology on how forest edges have a global impact on forest vertebrates. Dr Olivier and his team collected data on over 1 500 forest vertebrates and their work was recently published in *Nature* (page 46).

Our students also made us proud. Two postgraduate students, **Mr Marc W van Goethem**, a final-year PhD student in the Centre for Microbial Ecology and Genomics (CMEG), and **Ms Hilde von Grüning**, an MSc student in the Malaria Parasitology Molecular Laboratory, were among the top 100 students in the prestigious GradStar Awards for 2017 (page 18).

Many more outstanding achievements by our staff, students and affiliates can be cited, and we are very proud of all

of them. With this newsletter, we aim to showcase some of these achievements and we hope that you will enjoy this update on the latest developments in the Faculty.

We wish you all well for the coming festive season and trust that you will return refreshed in 2018.

Prof Jean Lubuma

Dean: Faculty of Natural and Agricultural Sciences



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The Faculty of Natural and Agricultural Sciences also has a **Facebook page**. Please **like** us.



From left: Prof Anton Ströh (Vice-Principal: Institutional Planning), Prof Edward Webb (Deputy Dean: Research and Postgraduate Education, Faculty of Natural and Agricultural Sciences), Dr Johan van Zyl (UP Agriculturalist of the Century and CEO of African Rainbow Capital), Prof Cheryl de la Rey (Vice-Chancellor and Principal) and Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences).

next hundred years of agricultural science at the University. The University is well-positioned to take up the challenges faced by agriculture,' said Prof Cheryl de la Rey, Vice-Chancellor and Principal of the University of Pretoria. Prof De la Rey was one of the keynote speakers at the official centenary celebrations.

Dr Johan van Zyl, a former dean of the Faculty, UP alumnus and CEO of African Rainbow Capital, emphasised the crucial role of academic institutions in the future of food production. 'There are a few megatrends that will shape and influence society in general, and the role of agriculture specifically. These include the formation of megacities, advances in biotechnology and the fourth industrial revolution, which will result in drastic change, a new norm and many challenges. In agriculture, the challenges are centered on training and research.'

'Agriculture is much more complex today as it no longer has to deal only with farming-related issues, but also with issues that address a wider eco-system. We will have to move away from agriculture as a single discipline to a multidisciplinary approach to focus on the broader issues in agriculture. I believe the University of Pretoria is well positioned to continue playing a leading role in this regard — for example, in the 2017 Center for World University Rankings the research conducted by the Faculty's Forestry and Agricultural Biotechnology Institute (FABI) earned UP the second position in the world for the study of mycology,' added Dr Van Zyl.

Dr Van Zyl was also announced as the University of Pretoria Agriculturalist of the Century at the gala event. He is honoured for his influence in both the Faculty and the agricultural sector as a whole. Dr Van Zyl was one of the masterminds behind the

Dr Johan van Zyl





Prof Cheryl de la Rey and Dr Johan van Zyl

“Agriculture is much more complex today as it no longer has to deal only with farming-related issues, but also with issues that address a wider eco-system.”

Postgraduate School of Agricultural and Rural Development in the Faculty, and played a major role in establishing FABI at UP. Over the past few decades, he has had a remarkable impact on his alma mater, the University of Pretoria. Dr Van Zyl still serves on the UP Council. He is a truly exceptional agricultural scientist, with two doctorates, more than 300 scientific publications, many industry awards and accolades, and a career that spans from academia, to private industry and community development.



Prof Piet Hammes, Prof Robin Barnard, Prof Hannes Robbertse, Dr Johan van Zyl, Dr Heinz Meissner, Dr Jan Hofmeyr, Prof Hettie Schönfeldt, Dr Raymond Naude, Dr Nina Strydom and Dr Phillip Strydom



Dr Johan van Zyl and Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences)

Prof Lise Korsten (Department of Plant and Soil Sciences)

Right: Prof John Annandale (Department of Plant and Soil Sciences), Mrs Sandra Annandale, Prof Edward Webb (Deputy Dean: Research and Postgraduate Education) and Prof Elize Webb (Faculty of Health Sciences)



Below: Dr Johan van Zyl, Prof Brenda Wingfield (Department of Genetics), Prof Fanus Venter (Department of Microbiology and Plant Pathology) and Prof Mike Wingfield (Director: FABI)



Two UP geneticists selected as NEF Fellows

Two brilliant female researchers in the Department of Genetics at the University of Pretoria (UP), Dr Vinet Coetzee and Dr Sanushka Naidoo, made headlines when they were both selected as Next Einstein Forum (NEF) Fellows* from 2017 to 2019.



supervisor. She completed her master's research on the role of genetic diversity in immune-associated genes on facial appearance, before receiving a bursary from Prof Dave Perrett at the University of St Andrews, Scotland, to complete her PhD under his supervision.

Coetzee's PhD work identified facial adiposity (or facial fatness) as a robust, but understudied, cue to health and attractiveness, and also identified specific facial dimensions associated with weight. While working on her master's and PhD, she published five peer-reviewed papers and received several travel awards, including the Experimental Psychology Society Grindley Grant. Coetzee returned to South Africa, where she completed two prestigious postdoctoral fellowships and joined the University of Pretoria, first as a lecturer, then as Senior Lecturer in 2017.

Her research focuses on developing fast, affordable and non-invasive methods to screen children for nutrient deficiencies and inborn conditions by training computer models to recognise the links between physical features and these conditions. Coetzee's team developed a 3D camera that costs one tenth of the price of comparable commercial systems. They are currently using this system to identify the specific facial features associated with Down syndrome in African infants and plan to expand this research to other conditions. The long-term aim of the project is to develop a facial screening tool that can help doctors identify a range of conditions more accurately. This tool will be especially helpful in situations where doctors have insufficient expertise in these conditions and inadequate funds for extensive testing. The 3D camera is also used in the ground-breaking African Longitudinal Facial Appearance and Health (ALFAH) study, which she launched in 2016. The study will test the associations between facial appearance, various health measures (such as hormones, blood pressure, body composition etc) and genetic markers in 4 000 African participants. Coetzee applied for the NEF Fellowship to widen her network of collaborators within Africa, showcase her research to a global audience and help to advance science from Africa.

Coetzee has published 22 papers in peer-reviewed journals, which have been cited over 800 times. In 2015, she was accepted as a member of the Royal Society of South Africa and has since received various awards, including a UP exceptional Young Researcher Award. She was also selected as a finalist for the National Science and Technology Forum (NSTF) South 32 Emerging Researcher Award in 2016 and 2017.

The NEF is a platform that leverages scientists to solve global challenges by bringing together leading thinkers in science, policy, industry and civil society in Africa. As an initiative of the African Institute for Mathematical Sciences (AIMS) and the Robert Bosch Stiftung, the NEF mobilises the brightest minds to look into the most persistent problems through the lens of Science, Technology, Engineering and Mathematics (STEM), as well as the social sciences.

Dr Vinet Coetzee's love for science and biology were cemented by a high school biology teacher who encouraged learners to become self-reliant and to look beyond the textbook for answers. Coetzee completed her BSc, honours and MSc in genetics at UP. During her honours year, she became interested in human mate choice research, or more generally, research aimed at understanding why we judge people as attractive and healthy. The only problem was that no one in South Africa was doing this type of research, so she approached her supervisor, Prof Jaco Greeff, who convinced Prof Louise Barrett (from Liverpool, UK) to become Coetzee's research



Dr Sanushka Naidoo is Senior Lecturer in the Department of Genetics and a candidate for Associate Professor. She is President of the South African Genetics Society for 2017/2018 and was awarded a Y-rating by the South African National Research Foundation (2015–2020).

Her research is dedicated to plant defence in forest species, with an emphasis on Eucalyptus. Forest trees are long-lived organisms that are exposed to multiple pests and pathogens in their lifetime. Dr Naidoo is focusing on mechanisms that can confer broad-spectrum, long-lasting resistance by dissecting gene families and responses to pests and pathogens. She has used genome editing technology (CRISPR) to develop plants with desired traits. With the development of new technologies, novel genetically modified crops are poised to increase yield and protect against pests and pathogens under harsh African climates.

Naidoo believes we are better equipped to harness this knowledge to address one of Africa's biggest challenges – that of food security. Her parents were teachers who encouraged her to ask questions about the world around her. She participated in mathematics and science Olympiads while at school, and was inspired by her science teacher to initiate a wildlife club. The club built a pond, establishing a complete ecosystem on the school grounds, to facilitate biology lessons. Naidoo participated in a wilderness leadership school organised by the South African National Parks Board. The week-long hike through the Umfolozi Game Reserve in KwaZulu-Natal cemented her love and curiosity for natural systems and species interactions.

Naidoo obtained a BSc from the University of KwaZulu-Natal, majoring in environmental and cell biology. She specialised in molecular biology for her master's degree at the University of Stellenbosch. Her research focused on the expression pattern of a key enzyme in the sucrose pathway in sugarcane. Perseverance and passion culminated in a distinction and the gene was patented. Before continuing with her PhD, Naidoo worked at the University of Cape Town as a microarray scientific officer. She subsequently received the Mellon Foundation Mentoring Award to complete her PhD in plant biotechnology at UP, and received the award for best PhD paper, presented by the South African Society of Plant Pathologists.

Dr Naidoo applied for the NEF Fellowship to expand her access to impactful collaboration and deliver next-generation thinking with African scientists, social scientists, schools, communities and government leaders. She wishes to facilitate education and acceptance, leading to an increased impact of plant biotechnology on society. She believes Africa's youth should study science, technology, engineering and mathematics to discover robust, tangible, natural patterns. Knowledge of such patterns can be harnessed to address the continent's unique challenges.

** The NEF Fellowship is a two-year programme that recognises Africa's best young scientists and technologists. These top-rated researchers and emerging leaders, at least 40 percent of whom are women, have the opportunity to advance their scientific career by, among other things, presenting their work at unique NEF Spotlight Sessions at NEF Global Gatherings. The NEF Fellows are automatically entered into the NEF Community of Scientists, an exclusive network that offers members opportunities for consulting, grants, research collaborations, speaking opportunities and career mentorship. In return, members participate in national and continental policy formulation, cross-cutting research and innovation activities, lead public engagement around science and technology in Africa, and provide mentorship to early-career scientists and students.*



Prof Esté van Marle-Köster

Prof Este van Marle-Köster elected as president of SASAS

Prof Esté van Marle-Köster, Head of the Department of Animal and Wildlife Sciences, was elected as president of the South African Society for Animal Science (SASAS) at the Society's 50th Congress that in Port Elizabeth during September this year. After having previously served as the first female ever on the Society's council from 1999 to 2000, she has now become the first female in its history to hold the office of president.

Prof Van Marle-Köster has been involved in teaching and research for the past 22 years. After having obtained an MSc (Agriculture) in Animal Breeding from the University of the Free State, she worked in the animal science industry for a number of years before joining UP in 1995. She subsequently completed a PhD (Agric) degree in Animal Breeding and Genetics, with a focus on molecular technology in farm animals, in the UP Department of Animal and Wildlife Sciences. She also established the focus area for genomic research and application in farm animals at the Department.

Over the years she has been involved in various research projects, which included research on the genetic biodiversity of local breeds of chickens, goats and cattle. Her most recent projects are aimed at using single nucleotide polymorphisms (SNP) markers and SNP chips to generate genotypic data in genome-wide association studies. She is the principal investigator for a project on genomic selection in a number of South African beef breeds, and the coordinator of the subcommittee for research in the Beef Genomic Programme. She also acts as the coordinator for the Dairy Genomic Programme funded by the Technology Innovation Agency (TIA).

Prof Van Marle-Köster has published widely in peer-reviewed journals and contributed to book chapters. She has also supervised several master's and doctoral students to completion. She holds a C2 rating from the NRF and is a registered Professional Animal Scientist with the South African Council for Natural Scientific Professions (SACNASP).

Prof Mike Wingfield receives Chinese Government Friendship Award

Prof Mike Wingfield, Director of the Forestry and Agricultural Biotechnology Institute (FABI) in the Faculty of Natural and Agricultural Sciences and President of the International Union of Forest Research Organizations (IUFRO), recently received the Chinese Government Friendship Award for 2017.

The award was presented to Prof Wingfield to acknowledge his 20 years of collaboration with Chinese colleagues in the field of tree health. This has for example led to the establishment of a formal Tree Health Programme with the China Eucalyptus Research Centre (Chinese Academy of Forestry) and FABI, known as the CERC/FABI Tree Protection Programme (CFTPP).

The CFTPP has and continues to produce extensive research outputs on tree disease and insect problems in natural forests and plantations in China and elsewhere in the world. This collaboration has also provided opportunities for many Chinese and South African students to complete postgraduate degrees in the tree health field.

The Chinese Government Friendship Award was presented to Prof Wingfield at a ceremony in the Great Hall of the People by Chinese Vice-Premier Ma Kai and this was followed by a gala event hosted by Chinese Premier His Excellency Li Keqiang.

Prof Wingfield's visit to China also provided an opportunity to meet with various colleagues with close ties to IUFRO. These included meetings with Dr Shirong Liu, Vice-president of the Chinese Academy of Forestry and IUFRO President's nominee and member of the Board of IUFRO, together with his staff; Mr Zhao Shucong, Chair of the Board of APFNet with which IUFRO has signed an MOU; Mr Peng YouDong, Vice Administrator of the State Forestry Administration and his colleagues; Mr Li ZhiYoung, Vice Executive Director of INBAR (International Bamboo and Rattan society and his colleagues as well as Dr ShuaiFei Chen, Extraordinary Staff member of FABI who provided Prof Wingfield with support and who brought prospective new CERC/FABI students from Zhangjiang to discuss future research projects.

*Prof Mike Wingfield and
Chinese Vice Premier Ma Kai*



Prestigious SAAB Gold Medal awarded to Prof Marion Meyer

This year Prof Marion Meyer from the Department of Plant and Soil Sciences became only the fifteenth recipient of the prestigious SA Association of Botanists' (SAAB) Gold Medal Award.

This medal is the SAAB's premier acknowledgement for outstanding plant science research and contributions to the advancement of plant science in South Africa and is awarded only in exceptional circumstances to outstanding candidates.

Prof Meyer's research impact is globally reflected in a number of ways. His work has been cited approximately 2 060 times and he is regarded by the Thomson Reuters Essential Science Indicators (ESI) as a 'highly cited scientist' (top 1% of research output globally) He also boasts an exceptionally high number of approximately 25 citations per paper in the fields of pharmacology and toxicology, and about 17 citations per paper in 'all fields'. According to Scopus, his H index is 30.

He was the Head of the former Department of Plant Science from 2001 to 2013 and received UP Exceptional Academic Achiever awards in 2009, 2012 and 2015.

His main research interest is the isolation, identification and mode of action of secondary compounds from medicinal and poisonous plants. Several novel compounds with bioactivity on erectile dysfunction, malaria, tuberculosis and other pathogenic bacteria and viruses have been isolated from traditionally used plants. Metabolomic approaches (mostly NMR) are employed in several projects to identify biomarkers and bioactive compounds. Prof Meyer collaborates with several international institutions, among others the **ITMO University in St Petersburg, Russia.**

UP student part of team to win 2017 IFAMA Case Study Competition

Melissa van der Merwe from the **Department of Agricultural Economics, Extension and Rural Development** not only represented the University at the International Food and Agribusiness Management Association (IFAMA) Conference in Miami, Florida earlier this year, but was also part of the South African universities case study team that won IFAMA's International Student Case Study Competition.

This competition, now in its 12th year, brings together students from around the world to demonstrate their investigative and problem-solving skills to provide innovative solutions to practical problems. The competition provides a global stage for students and their universities to showcase the next generation of agribusiness leaders. The Case Study Competition consists of two rounds. In the preliminary round, teams of between three and five students are expected to work through a complex case study in four hours. The teams receive a real-world challenge, in case-study format, from a leading agribusiness. They are then required to develop a creative and practical solution to the problem and build a presentation to communicate their solution to a panel of judges. Six teams are subsequently selected to participate in the final round, in which an addendum to the case is provided. Teams are allowed another four hours to work on the elaborated case before once again presenting their innovative solutions to a panel of judges. The final-round judges include representatives of the agribusiness featured in the case study.

This year the featured agribusiness was Bayer Crop Science. Although the company managed to expand its global footprint through its Food Chain Partnership, it faced some challenges in respect of its expansion into emerging economies through small-scale farmers. Being from the African continent, Van der Merwe and her team not only understood Bayer's unique challenge, but could also pre-empt some of the potential problems faced by agribusinesses that want to grow their footprint in emerging economies. This gave them a competitive advantage when they had to go head to head with some of the best universities in the world.

Team South Africa, the winners of the 12th IFAMA International Student Case Competition. From left: JW Swanepoel (University of the Free State), Melissa van der Merwe (University of Pretoria), Heinrich Jantjies (University of Stellenbosch), and Johann Boonzaaier (University of Stellenbosch)



Melissa van der Merwe

The South African team's presentation, titled 'Selling Lindiwe's story', told the story of a female small-scale cassava farmer in Mozambique who, after the passing of her husband, became the main breadwinner. In this situation, the South African team indicated how Bayer could play a major role in not only selling chemicals to these farmers, but more importantly in changing the stories of small-scale farmers like Lindiwe. They recommended a strategic partnership with ABInBev, the main buyer of cassava produced by these small-scale farmers, who use the product as a cheaper beer-base substitute. They also recommended a local partner, Value Chain Insights (a fictitious company owned and managed by the South African team), that understands the political, social and economic environment of these emerging countries and would be able to facilitate the relationship between Bayer and the small-scale farmers.

According to the panel of judges, the innovative approach and motivations for investing in strategic partnerships with ABInBev and Value Chain Insights, as proposed by the South African team, went beyond financial benefits to also include corporate social responsibility and overall rural development. Lindiwe's story was, however, the decisive factor. The South African team was the only team to put a face and a story to the often invisible small-scale farmers. The judges felt that the South African team stood out in that they understood the challenges faced, not only by the small-scale farmers, but also by the agribusinesses wanting to expand in emerging economies.

When asked about their experience, the South African team said that they focused on each team member's strengths and experiences and just did their best. Their advice to future student teams is: 'Think outside the box!'





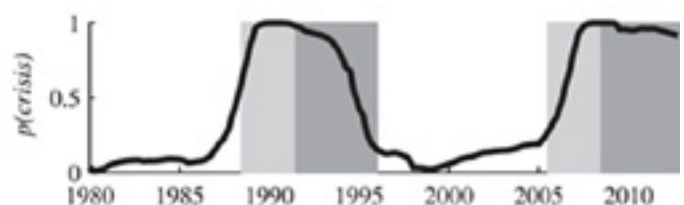
ASSA awards UP researchers RGA prize

The Actuarial Society of South Africa (ASSA) awarded their annual RGA Prize for the Best Published Research of 2016 to researchers at the University of Pretoria (UP) for an article titled 'Systemic banking crisis early warning systems using dynamic Bayesian networks'. The paper was co-authored by Dr Joel Dabrowski (former postdoctoral fellow in the Department of Actuarial Science), Dr Conrad Beyers (Barclays Africa Chair in Actuarial Science, Department of Actuarial Science) and Prof Pieter de Villiers (Group Head: Signal Processing and Telecommunications, Department of Electrical, Electronic and Computer Engineering).

Dr Beyers holds a PhD in Mathematics from UP and is qualified as an actuary through the Institute and Faculty of Actuaries. Prof De Villiers obtained his PhD in Information Engineering from Cambridge University and specialises in data science applications in engineering and finance.

The research contributes to the body of methodologies aimed at detecting financial crises before they occur. For decades, the literature on banking crisis early warning systems has been dominated by two methods, namely, the signal extraction and the logit model methods. However, these methods are not able to capture changes in the financial system over time. In this study, dynamic Bayesian networks are applied as systemic banking crisis early warning systems. These dynamic Bayesian networks provide the means to model a system's behaviour over time and then estimate the probability of an impending crisis. The results indicate that the dynamic Bayesian network models can provide more accurate early warnings than the conventional methods.

The figure below shows an example of the model's application. Finland's 1990–1995 and 2008 banking crises are predicted. The black line indicates the probability of a crisis, the light grey region indicates the three-year period leading to a crisis, and the dark grey region indicates the period of the actual crisis.



These early warning systems can be of use to central banks, where early intervention can contribute significantly towards averting financial crises and financial instability. Furthermore, because the theoretical methods used are of a general nature, the model could potentially be useful in a range of other environments, including individual banks and investment funds.

The study was performed with support from the Barclays Africa Chair in Actuarial Science, which was established in 2013 and has since become a leading centre for actuarial and risk research in South Africa. The Chair has a strong interdisciplinary approach, involving researchers and postgraduate students from a range of disciplines, including actuarial science, banking law, economics, engineering, geosciences (UP Natural Hazard Centre), mathematics and statistics. The main focus areas of the Chair are risk modelling for financial systems, credit risk modelling (including credit ratings) and financial applications of data science.

One department – two new PhDs

The graduation ceremony on 6 September 2017 was a special occasion for the Department of Agricultural Economics, Extension and Rural Development. During this ceremony, Melissa van der Merwe and Danie Jordaan, both lecturers in the Department, were awarded their Doctor of Philosophy degrees in Agricultural Economics.

In her thesis, titled 'Asymmetric information, principal-agent behaviour and governance mechanisms in the South African lamb supply chain', Dr Van der Merwe investigated the development and success of niche lamb products by focusing on collective reputations, agency theory problems, and the alignment of enforcement and governance mechanisms in the Karoo Lamb supply chain. The Bill and Melinda Gates Foundation and the South African Red Meat Research and Development Trust funded the research.

The study yielded four journal papers, two of which have already been accepted for publication with co-authors JF Kirsten and JH Trienekens. The first will appear in the *International Food and Agribusiness Management Review* as 'The Karoo Meat of Origin certification scheme: A silver bullet', and the other in *Agricultural Economics* as 'Information sharing as a safeguard against the opportunistic behaviour of South African Karoo Lamb farmers'. When asked about her dreams for the future, Van der Merwe said: 'I am already living my dream. I am so passionate about student learning and the personal development of my students that I cannot imagine myself doing anything else. It is not often that one has a job that one loves, and that contributes so much to society.'

In Dr Jordaan's thesis, titled 'Agribusiness value chain fragility and coordination strategies: Case studies of South African value chains', he introduces 'fragility' as a phenomenon in agribusiness chains.

According to Dr Jordaan, agribusiness chains face accelerating volatility, complexity and uncertainty that make them increasingly vulnerable to cascading and explosive consequences. The study found a golden thread of critical elements that affect the fragility of the overall chain, while other elements affect the fragility of particular actors in the chain due to their unique characteristics. The Bill and Melinda Gates Foundation and the South African Red Meat Industry Trust also funded this research.

Two papers from Dr Jordaan's research are currently under review for publication in international peer-reviewed journals. As an emerging academic in agricultural economics and agribusiness, Dr Jordaan's vision is to strengthen his academic profile, expand the Department's research profile in agribusiness, and contribute to the continental agribusiness discourse in a meaningful way. His immediate ambition is to pursue a postdoctoral fellowship to leverage more research outputs and projects from the PhD thesis into the academic mainstream. He is passionate about capacity building, and values lecturing at the Department of Agricultural Economics, Extension and Rural Development, as well as in the Collaborative Masters in Agricultural and Applied Economics programme. In the interest of elevating the profile of the Department and the University, he is driven to develop links with agribusinesses, universities and research networks on the continent to pursue a continental research and outreach agenda.

The Department of Agricultural Economics, Extension and Rural Development is proud to count both Dr Van der Merwe and Dr Jordaan among the members of their team, and the Department is excited about their contributions to the University of Pretoria's mission in pursuing recognition and excellence in its core functions of research, teaching and learning.

Dr Melissa van der Merwe



Dr Danie Jordaan





UP to co-host International Sorghum Conference in 2018

The first world conference on sorghum in over 30 years will be hosted jointly by the Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet of Kansas State University, USA, and the University of Pretoria (UP) in April 2018.

Prof John Taylor and Dr Janet Taylor of the Department of Consumer and Food Science are serving as chair and secretary respectively of the local South African organising committee of this conference with the theme 'Sorghum in the 21st Century: Food, Feed and Fuel in a Rapidly Changing World'.

The sorghum conference will cover all aspects of sorghum, including genomics, breeding, agronomy, food science and technology, animal nutrition, biofuels, small-holder and emerging commercial sorghum farming, human nutrition and health, market development, and industry and consumer needs.

Sorghum, the world's fifth most important cereal crop, is indigenous to Africa and is exceptionally well-adapted to cultivation in Africa's arid and sub-tropical environment. Sorghum is a highly versatile crop, both as a traditional and nutritious grain staple for food and beverages and now as a speciality food grain, and grain and biomass livestock feedstuff and biofuel source.

The conference focus is on the unique attributes of sorghum and how they can help address the looming global concerns of the twenty-first century, including food and nutrition security, climate change, renewable energy and environmental sustainability.

The conference speakers include Prof Gebisa Ejeta, sorghum breeder from Purdue University and 2009 World Food Prize Winner, Profs David Jordan and Emma Mace from the University of Queensland who have sequenced the genomes of 40 different sorghum types, and Prof Joseph Awika from Texas A&M University, an expert on the special health-promoting attributes of sorghum.

Other staff from the Faculty of Natural and Agricultural Sciences involved in the conference organisation include Profs Sheryl Hendriks, Gyebi Duodu, Riette de Kock and Naushad Emmambux. Mr Abadi Mezgebi, a PhD student from Ethiopia, is a member of the conference student chapter subcommittee.

For further information contact John directly on 012 420 4296, or send an email John.taylor@up.ac.za or visit the Sorghum Conference Website at <https://21centurysorghum.com>



Dr Janet Taylor



Prof John Taylor

UP agricultural economists cream of the crop at AEASA

The Department of Agricultural Economics, Extension and Rural Development performed exceptionally well at the annual conference of the Agricultural Economics Association of South Africa (AEASA) held in Durban during September. Not only were more than a third of the accepted oral papers contributed by staff and students of the University of Pretoria (UP), but the Pretoria team also walked away with numerous prizes.

Members of the Department's lecturing corps won the first and second prizes for best contributed papers. Dr Danie Jordaan won first prize for his paper entitled 'Measuring the fragility of agribusiness value chains: A case study of the South African lamb chain', while Dr Melissa van der Merwe won second prize for her paper, 'Investing in collective reputation: Sheep farmers, geographic indicators and collective action in the Karoo, South Africa'.

Other UP achievements include awards for the best paper submitted to the conference by a PhD student, won by Colleta Gandidzanwa, and for best published article in the *Agrekon* journal. The latter was on demand elasticities in the South African meat industry, and was published by Delpont, Louw, Davids, Vermeulen and Meyer in

Agrekon 56(1), in their capacity as researchers in the Bureau for Food and Agricultural Policy. Tracy Davids won the second prize for best published article, for her work on the competitiveness of the South African broiler industry. The award for best poster presentation went to the UP team, funded by the Agricultural Research Council, for their data-rescue work in memory of the late Dr Frikkie Liebenberg, who pioneered this work.

In addition, Prof Sheryl Hendriks was acknowledged for her significant contribution to the impact factor of the Association's journal *Agrekon*, with her authored and co-authored papers contributing 55% of the journal's impact-factor citations for 2016.

During the same meeting, Prof Ferdi Meyer was elected as the Association's new vice president.

The Department is proud that their hard work is bearing fruit and that students and staff members alike are ensuring that Agricultural Economics at the University of Pretoria are synonymous with excellence.

From left: Prof Meyer, Ms Davids, Ms Louw, Dr Van der Merwe, Prof Machethe, Dr Jordaan, Ms Gandidzanwa and Ms Mamabola



Tuks win fourth SASAS Veeplaas Student Quiz

Team Tuks is undefeated for the fourth consecutive year after the Veeplaas Student Quiz at the 50th annual South African Society for Animal Science (SASAS) Congress.

The quiz is a regular event at the congress and is open to all Animal Science departments at South African universities. Each team has three participants who are either final-year Animal Science students or busy with postgraduate studies (MSc level) in Animal Science. All participants must be younger than 25 years of age.

Questions relate to animal reproduction, physiology, nutrition, animal breeding and genetics, and applied animal science. After the first round, the three teams with the highest scores advance to the final round, in which each team is asked questions individually. The team that answers the most questions correctly in the final round wins the quiz.



*Winners of the 2017 SASAS Veeplaas Student Quiz (Stockfarm Magazine).
From left: Team Tuks: Reinhardt Steyn, Jani de Vos and Matthew Hughes.*

Nick de Beer recognised as Best First-year Lecturer in NAS

'A true epitome of a good and inspiring lecturer' and 'he always brings excitement to the class and shows a lot of determination and passion for his subject.' These were just some of the comments of the students who voted Mr Nick de Beer, lecturer in Chemistry as the Best First-year Lecturer in the Faculty of Natural and Agricultural Sciences (NAS) on 1 December 2017.

"He challenges students intellectually during his classes and gives a lot of examples to independently do and he goes through them in the next class," was another student's observation on Mr De Beer's abilities as a first-year lecturer.

This Award was initiated by the Faculty's student house, NATHouse, to recognise the extra effort that the first-year lecturers put into their teaching and learning activities. According to Dr Quenton Kritzing, guardian of NATHouse, "their efforts are really appreciated by the students and this Award serves as an encouragement for the lecturers."

A great word of thanks was also extended to the Executive Committee members of NATHouse for their efforts with the arrangements (among others marketing, acquiring the nominations, the voting process) related to the Award.

The other nominees for the Award were: Dr Kershney Naidoo (Genetics), Dr Rory Biggs (Mathematics and Applied Mathematics), Dr Damilola Momodu (Physics), Dr Nina Strydom (Statistics), Dr Janet van Niekerk (Statistics), Mr Johan Janse van Rensburg (Physics) and Dr Jan Harm van der Walt (Mathematics and Applied Mathematics).

Dr Quenton Kritzing (NATHouse guardian), Joseph Ocaïlap (Vice-Chair and Treasurer: NATHouse), Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences) and Mr Nick de Beer.





Prof Riëtte de Kock



Ms Andrea Wilson

Women in Science Awards 2017 honours two scientists in NAS

Two scientists from the Faculty of Natural and Agricultural Sciences (NAS) were honoured during the 2017 Women in Science Awards (WISA), hosted by Minister of Science and Technology Naledi Pandor.

Prof Riëtte de Kock from the Department of Food Science was awarded the Distinguished Woman Researcher: Research and Innovation award, while Ms Andrea Wilson, a PhD student from the Forestry and Agricultural Biotechnology Institute (FABI) received a DST Fellowship.

The awards recognise the achievements of prominent women scientists and provide motivation for the increased participation of women scientists in research. The theme for WISA 2017 is 'Women's

economic empowerment in the changing world of work' (in line with the United Nations Commission on the Status of Women priority theme for 2017).

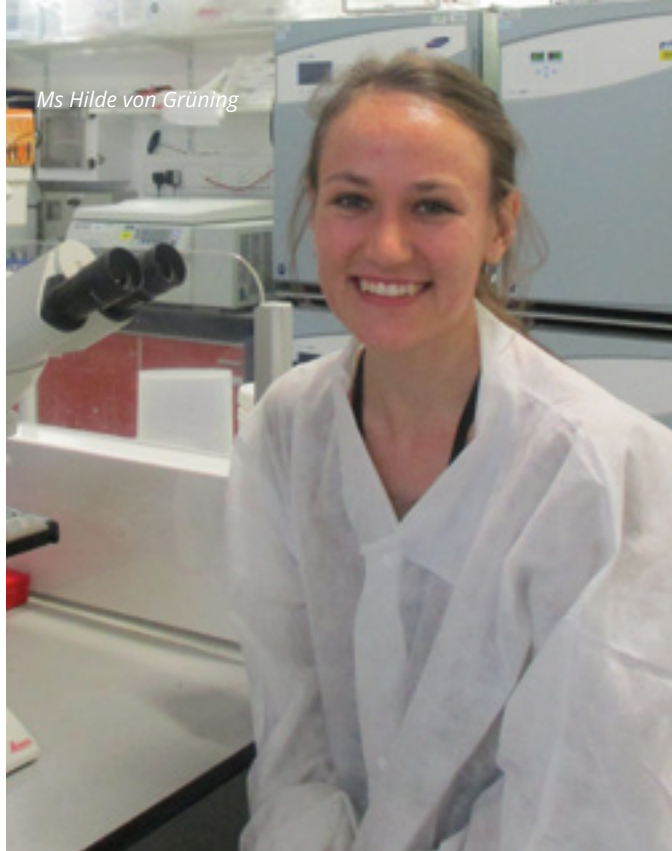
Prof De Kock's research focuses on the optimisation of the sensory properties of food and beverages that contribute to the nutritional status and wellbeing of consumers in Sub-Saharan Africa.

'The University of Pretoria is honoured to have our women scientists, along with two students, recognised by these prestigious awards. We congratulate them all on their hard work and commitment to excellence,' said Prof Stephanie Burton, Vice-Principal for Research and Postgraduate Education.

Mr Marc W van Goethem



Ms Hilde von Grüning



Two NAS postgraduate students are Gradstar Awardees

Two postgraduate students from the Faculty of Natural and Agricultural Sciences (NAS), Mr Marc W van Goethem, a final-year PhD student in the Centre for Microbial Ecology and Genomics (CMEG), and Ms Hilde von Grüning, an MSc student in the Malaria Parasitology Molecular Laboratory, were under the top 100 students in the prestigious GradStar Awards for 2017. Thirty students from the University of Pretoria were selected in total.

Mr Van Goethem had the following to say: "This award means a great deal to me. Firstly, I would like to thank the various sponsors of the awards for their support in connecting us with business mentors and for providing such a lovely conference. Overall, I have had a wonderful experience in the Gradstar programme, and I will continue persevering in my scientific research and would like to teach students about science through different science communication platforms."

Ms Von Grüning is an MSc student in the Malaria Parasitology Molecular Laboratory under the SARCHI Chair in Sustainable Malaria Control with Prof Lyn-Marie Birkholtz in the Department of Biochemistry and also a member of the University of Pretoria Institute for Sustainable Malaria Control (UP ISMC). Her MSc work is titled "CRISPR/Cas9 mediated deletion of genes encoding putative cell cycle regulators in *Plasmodium falciparum*". In this study, key regulators of the atypical cell cycle of the *P. falciparum* parasite have been identified and subsequently genetically modified using the renowned CRISPR genome editing tool. This has been done to prove that these regulatory elements are essential for parasite survival and could thus be targeted in future chemical intervention strategies.

The prestigious GradStar Awards recognise South Africa's Top 100 talented university students who not only excel academically, but also display leadership and involvement in their respective fields. Students were identified based on a stringent four-stage judging process by means of worksheets, oral presentations and questionnaires. The criteria include the candidate's ability to think logically and out of the box, solve problems, attitude, altruism, commitment, and communication skills. The event, hosted by BlackBark Productions, took place at the Indaba Hotel, Spa and Conference Centre during September 2017.

Students and potential employers were connected to discuss relevant topics and current affairs as part of workshops and engagement sessions. Notable attendees included the remarkable GradStar patron and motivational keynote speaker Dr David Molapo, and South Africa's youngest parliament member Hlomela Bucwa, who both delivered passionate talks on embracing life, becoming active members of society and leading the path to finding solutions to SA's challenges in the future. Companies involved included Fasken Martineau, FNB, Comair, PWC and Khonology. This allowed students not only to network and learn from the involved industries, but meet and be mentored by the RisingStar Award holders.

For more information on the GradStar awards, go to <http://gradstar.co.za/> and the official Facebook page at <https://www.facebook.com/GradStarSA/>.

UP alumna receives prestigious UK Commonwealth Scholarship

Ms Estine Clasen, an alumna of the University of Pretoria (UP), has been awarded a UK Commonwealth Scholarship for the 2017 intake. She is currently pursuing an MSc in Biodevices at the University of Southampton in the UK.

Ms Clasen started studying towards a BSc (Veterinary Biology) in 2009, but changed her course to a BSc (Biotechnology), which she obtained in 2011. While in her final year, she also completed a year-long mentorship programme at UP's Forestry and Agricultural Biotechnology Institute (FABI), where she says she enjoyed learning about the day-to-day activities of working in natural sciences.

The following year, she enrolled for a BEng (Electronic Engineering) at UP, and obtained this qualification in 2016. Her final-year project for this second degree, which was done in collaboration with the CSIR, afforded her the opportunity to work in their laboratories with exciting technologies and equipment. This contributed to her wanting to continue her studies, combining biological sciences and electronic engineering. 'My knowledge about biotechnology, biochemistry, genetics and microbiology, in combination with electronic engineering skills, puts me in a unique position to understand biological problems in depth and find engineering solutions for these problems,' she explains.

She applied for the Commonwealth Scholarship, with UP as her nominating agency, and says that her study leader from 2016, Dr Trudi-Heleen Joubert, supported her every step of the way. 'I approached Dr Joubert in 2015 to find out more about her research group and doing my final-year project with her. Even back then, I told her that I would ideally like to do my master's in the UK. She has supported me in the process of my applications at universities in the UK, as well as in my bursary applications.'

Ms Clasen describes her time at UP as an interesting journey, especially in so far as making the transition from natural sciences to engineering, which she says differed much more than she expected. 'It wasn't always easy, but if I could do it all over again, I'd follow the same educational trajectory. I believe that every choice in life makes a difference, and we have to decide whether the difference we make each day will be positive or negative. Not choosing to do something is also a choice, often with the same consequences as doing something drastic. I try to make each day matter by simply moving forward, even if some days it is with minute steps, towards my dreams and having a positive influence. When I look back over my years at UP, I can now see that every day did matter, and that I wouldn't have received this new opportunity without working towards this goal every day for the past few years, step by step,' she says.

The Commonwealth Scholarship and Fellowship Plan is one of the largest and most prestigious scholarship schemes for international study in the world. Since its establishment in 1959, approximately 30 000 individuals have benefited, and around 25 000 of these have received awards funded by the UK government and managed by the Commonwealth Scholarship Commission in the UK. The Commonwealth



Ms Estine Clasen

Master's Scholarships provide recipients with 12 months' support towards the completion of a full-time, taught postgraduate qualification at an eligible UK university, and also cover students' air fares to the UK and back home, tuition and examination fees, a personal maintenance allowance to cover their accommodation and living costs and, if applicable, a grant towards the expenses involved in preparing a thesis or dissertation. On expiry of the scholarship, South African students are required to return home and remain in this country for a period of at least five years.

Recipients of these prestigious scholarships must meet stringent selection criteria, with particular emphasis placed on the academic merit of candidates, the quality of their research proposals and the likely impact of the proposed work on the development of their home countries. Candidates are also responsible for securing admission to their preferred institutions in the UK before submitting their scholarship applications.

Commonwealth Scholarships and Fellowships in the UK for applicants from developing Commonwealth countries, such as South Africa, are funded by the UK Department for International Development, with the aim of contributing to the UK's international development aims and wider overseas interests by supporting excellence in UK higher education and sustaining the Commonwealth principles.

Ms Leanne van Zyl, Postgraduate Scholarship Manager at UP, coordinates the advertising, administration and preliminary selection of applications for these awards. The preliminary list of successful candidates from UP is forwarded to Universities South Africa (USAF) for the national selection process, after which a final list of candidates is submitted to the Foundation for final selection.

[Click here](#) for more information about international scholarship opportunities available to UP students.

UP supports Eskom Expo for Young Scientists with bursaries

The University of Pretoria (UP) has a long and proud tradition of being one of the main sponsors of the Eskom Expo for Young Scientists. Its 2017 Expo sponsorship, hosted in Johannesburg from 3 to 6 October, was no exception. The Faculty of Natural and Agricultural Sciences (NAS) awarded two bursaries to the value of R48 000 to two learners in grades 11 and 12.

The Expo, initiated by Dr Derek Gray 37 years ago and launched at UP, continues to grow. It is supported and endorsed by the Department of Public Enterprises, the Department of Science and Technology, and the Department of Basic Education. Learners from grades 7 to 12 annually have the opportunity to showcase their science projects in many different categories.

The prestigious UP Derek Gray Award, which includes a full bursary to study science at UP and a fully paid trip to Sweden to represent Africa at the International Youth Science Seminar to be held there in December, was also awarded at the Expo. Rahil Samlal from St Dominic's Academy in KwaZulu-Natal won this bursary with his project, titled *Alternative method to cure bacterial infections*.

In addition to the UP Derek Gray Award two NAS two bursaries of R24 000 each were awarded. Ms Thajna Sweparsad from Ladysmith High School in Northern KwaZulu-Natal received a bursary for her project *A novel approach to economically rehabilitate degraded ecosystems* in the category Environmental Science. Ms Ntombizonke Nsibande from Hlamvana High School in KwaZulu-Natal North Coast was awarded for her project *Colocation esculent (amadumbe) nutritious flour* in the category Food Science, Food Technology and Healthy Eating.

These young scientists are enthusiastic about their projects and wish to see their innovations

being implemented in the future. Department of Science and Technology Director General Dr Phil Mjwara congratulated all the winners who represented South Africa at the international science fair and encouraged other participants not to abandon their project ideas.

Expo for Young Scientists Executive Director Mr Parthy Chetty emphasised that all judges and staff working at the Expo were volunteers who gave their time selflessly to promote science education and develop the potential of these learners.

Top: Ms Thajna Sweparsad
Bottom: Ntombizonke Nsibande

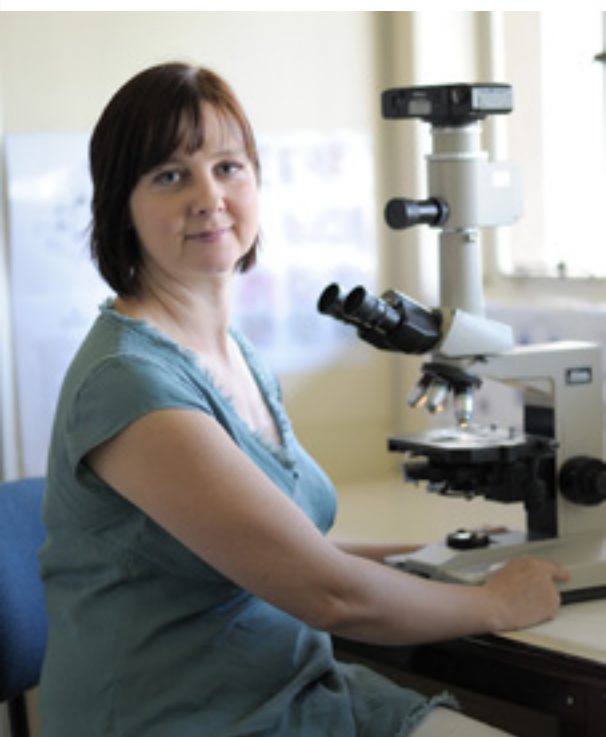


Community of Practice in malaria elimination hosted at UP

The University of Pretoria (UP) will host its first Community of Practice (CoP) focusing specifically on the elimination of malaria in the UP Institute for Sustainable Malaria Control (UP ISMC). This National Research Foundation (NRF) initiative endeavours to provide vehicles to enable the implementation of integrated trans- and multidisciplinary solutions to address societal challenges and to ultimately bring change to the lives of South Africans through evidence-based research findings. The envisaged aim of communities of practice is to provide research-driven, innovative solutions that will inform and guide policy development, as well as translate research outputs into tangible outcomes with social and/or economic impact.

The proposed CoP in malaria elimination will incorporate the current expertise of five DST/ NRF South African Research Chairs (SARChI) from four of the top research- intensive universities in the country. Among them will be Prof Lyn-Marie Birkholtz from the University of Pretoria, who

Prof Lyn-Marie Birkholtz



is the current incumbent of the Chair in Sustainable Malaria Control hosted in the Department of Biochemistry, who will lead the new CoP. Prof Birkholtz was also recently notified that her SARChI appointment has been renewed for a further five years, which will become effective in 2018.

South Africa hopes to eliminate malaria in the next five years, and this will require concerted and focused research and operational efforts. 'We are in a unique situation in South Africa, as several research activities in the country have been supporting the elimination strategy, and this includes several SARChI Chairs,' Prof Birkholtz said. 'It makes strategic sense to combine the considerable available expertise in this regard into a focused community of practice that will give us strength in numbers to take the South African malaria elimination agenda forward.'

The CoP will focus on intervention strategies for malaria elimination including the discovery of novel drug leads (Prof Kelly Chibale, University of Cape Town, Chair in Drug Discovery) used with optimised delivery systems (Prof Bert Klumperman, Stellenbosch University, Chair in Advanced Macromolecular Architectures) against both the malaria parasite (Prof Lyn-Marie Birkholtz, UP, Chair in Sustainable Malaria Control) and mosquito vectors (Prof Maureen Coetzee, University of the Witwatersrand, Chair in Medical Entomology and Vector Control) and modelled within a malaria elimination setting (Prof Jacek Banasiak, UP, Chair in Mathematical Models and Methods in Biosciences and Bioengineering). The CoP will integrate and formalise these interactions and, for the first time, coordinate research efforts in South Africa aimed at the discovery of drugs to eliminate malaria. The CoP's significance and innovation is therefore embedded in its strategies focused on drug discovery for malaria elimination through solution-oriented research that will lead to innovations that address societal challenges in South Africa.

The CoP on Malaria Elimination has the potential to make a significant contribution to malaria elimination in South Africa (and regionally) in the next few years by providing novel health innovations and influencing strategic decisions. Furthermore, the interdisciplinary and integrated nature of the research undertaken by the CoP will also train a new generation of South African scientists in implementing disease-elimination strategies.

According to Prof Tiaan de Jager, Director of the UP ISMC and the MRC Collaborating Centre for Malaria Control, the trans- and multidisciplinary approach of the UP ISMC has proved to be very successful. He pointed out that the CoP will be taking it a step further by bringing the leading minds in the country together in the fight against malaria and added that he was proud that UP will host the CoP on Malaria Elimination, which is a reflection of the good work done by Prof Birkholtz's SARChI Chair.



Ms Fhatuwani Nemakhavhani

Fhatuwani Nemakhavhani – the first black female actuary from UP

“Don’t let your background determine your future. You should dream big and not be scared to venture into new territories.” These are the wise words of Miss Fhatuwani Nemakhavhani (26) who recently became the first black female actuary to ever be produced by the University of Pretoria (UP).

Fhatuwani is a strong and courageous young lady who hails from the Tswinga village about 8km from Thohoyandou in the Limpopo province. In 2009, as a young matriculant, she travelled on her own by bus to enrol for her studies in Actuarial Science at the University of Pretoria.

She smiled when she explained that this was less frightening than when she had to go for her bursary interview with the South African Actuaries Development Programme (SAADP)* at the University of Witwatersrand in her matric year, where she had to find her way to Wits from Johannesburg Park Station. “That really toughened me up.”

Fhatuwani really fell in love with Mathematics when she was afforded an opportunity to do Grade 9 and 10 at Allen Glen High School in Johannesburg. She was temporarily fostered by her mother’s employer who lived in Gauteng at that time. “I had to adapt to be taught all my subjects in English – it was a big cultural and language change. But once I grasped Mathematics, I realised that I don’t need to know the language perfectly to excel in Mathematics. I was doing

well in Mathematics, and in Grade 10 I came second in Mathematics in my grade. I realised that I loved Mathematics so much that I could make a career of it

“In Grade 11, I went back to my former high school, Marude Secondary School, in Venda to complete my high-school education and was now a top achiever in Mathematics. From the first quarter in grade 11 until I matriculated, I achieved first position in my class. Matric was a challenging year for me because I did not know what I was going to study at varsity, let alone if I would have an opportunity to pursue tertiary education at all. My mother, being a domestic worker, was in no position to pay for my tertiary education, which meant I needed to find other means to fund my studies. This encouraged me to study hard and focus on my books with the hope of obtaining good enough marks in order to be awarded a bursary.”

“I was fortunate when I got invited to attend the Limpopo’s matric summer camp organised by the Thuthuka Programme and the Department of Science and Technology. It was at this camp that I obtained two very important documents that would go on to change my life for the better. The first one was a bursary application form from SAADP to study Actuarial Sciences. At this stage, I didn’t even know what Actuarial Sciences was all about, all I knew was that you needed to be good in Maths and must obtain good grades in English in order to do the course. During the camp I also met a

senior student advisor from UP, Mr Fred Ratshisevhe, who supplied me with the UP's admission application form which turned out to be the only university I ended up applying for. At the end of 2009, I made history in my high school by becoming the first student in my school's history to pass Mathematics with 100%. I also got invited to the provincial matric awards function in Polokwane."

Despite her excellent matric results, Fhatuwani was unfortunately not awarded the SAADP bursary. This was devastating news for the 17-year-old, but it did not deter her from coming to study at UP. "I felt let down, I was about to give up on my dreams of going to university because I had no funding". But an important call came from Fred, while she was still at home, who gave her the good news that she had been accepted to study Actuarial Sciences at UP. This was not the good news Fhatuwani hoped for, but when Fred learned that she had been rejected a bursary, he became the beacon of hope for her and through his encouragement and assistance she was placed in Asterhof Residence as well as receiving a loan from the National Student Financial Aid Scheme (NSFAS). "I promised myself that I will work hard and prove everybody wrong and earn a spot in SAADP. After the first semester I got four distinctions out of my seven subjects and then SAADP awarded me a full bursary for my tuition and residence"

In her second year, Fhatuwani also became a Golden Key member and was selected to be a member of UP SIFE (Students in Free Enterprise – now known as Enactus) whose aim is to find solutions for problems experienced by students on campus. During her undergraduate studies, she also received an award for passing all her Statistics modules from first year to third year with distinction. She completed her bachelor's degree at the end of 2011 and was the only black South African in the Faculty of Natural and Agricultural Sciences to obtain her degree in Actuarial Science with distinction (*cum laude*).

"In 2012 I enrolled for my honours degree in Actuarial Science. During my honours year, I was tutoring other SAADP students as well as being an assistant lecturer in Statistics. I was also the deputy president of the student society of the Association of South African Black Actuarial Professionals (ASABA), and treasurer for the Campus Crusade for Christ."

"I am grateful beyond measure for the opportunity to study at UP, and for my friends' support and mentorship. I was very selective with the choice of friends I made, because I had to focus on my studies and keep my bursary. One of my best friends was Emily Ngu (Mbatu), a lady from Cameroon, who is very smart and had a similar background to my own and we really got along well. The library became our second home during our varsity time," she admitted.

Fhatuwani also acknowledged the role of Ms Refilwe Lehobo from UP SAADP, who played an important part both in her academic and her personal life.

After completing her honours degree, she started as an actuarial analyst in 2013 at Liberty Life. She was then promoted to senior actuarial analyst in 2015 and after that she assumed the role of

specialist actuarial auditor. In July 2017, at the age of 25, Fhatuwani passed her final actuarial board exam to obtain a double qualification namely: FASSA (Fellow of the Actuarial Society of South African) and CERA (Certified Enterprise Risk Management Actuary). She currently works for ABSA Life in the Capital and Balance Sheet Management team.

"I always knew that there was something greater inside me, despite the odds that were stacked against me," Fhatuwani explained when asked about her success at such a young age. "I knew that God had a master plan for me, and I had to trust in Him fully for my future. My faith has always given me strength and God has never forsaken me."

Fhatuwani reiterates a message of hope for young people: "I believe in using opportunities, but you have to be prepared when opportunities come. Don't be scared to dream, but be willing to work hard – there is no substitute for hard work. It is also important to have mentors; they played a very big role in my life. Also use technology to your advantage – information is power. And remember where there is a will there is a way."

*The South African Actuaries Development Programme (SAADP) is an independent, non-profit company that was established with the backing of Sasria SOC Ltd. The Programme seeks to actively address the problem of the acute shortage of actuarial skills in the black community.

Prof Jean Lubuma, Dean of the Faculty of Natural and Agricultural Sciences and Fhatuwani Nemakhavhani



Hard work adds up for blind mathematics whizz

Theodor Loots graduated in September with a PhD in Mathematical Statistics. He also has a black belt in judo and plays piano, violin and guitar.

Yet people ask him if he needs help fastening his seatbelt. It is an issue that frustrates Theodor, who was born partially blind and lost his vision altogether in his third year of university.

"When I do my work I try to do it as well as my colleagues or better or faster. It takes time and you need to prove yourself constantly," Theodor (33) said.

In 2000 Loots became the first visually impaired man to get a black belt in judo. He then set another precedent by getting a distinction for his master's degree in Mathematical Statistics at the University of Pretoria, followed by his PhD this year.

It is a far cry from Grade 10, when he was getting 3% and his teacher told him to give it up.

But a new teacher changed all that, sparking

his passion for numbers.

At school Theodor used equipment to enlarge the typeface in his textbooks. But when he lost the little vision he had, he had to rethink whether he should continue with mathematical statistics or change his course.

"I wouldn't say quitting was never an option (but)... I had to think about my life and where I was going and what options I had."

In the end Theodor chose statistics, because of his love for numbers. But it wasn't easy. He had to type all his text books in Braille before he could start studying.

"It took a very long time... and my Braille isn't very good."

Initially he completed assignments in Braille and then read them to a lecturer, who would type them out. This tedious process meant he took an extra two years to complete his degree.

Then followed master's and PhD.

Theodor said he was passionate about statistics because of the "pure joy of solving a very difficult problem". He likes how the subject enables him to relate to various people.

But Theodor's passion isn't only for numbers. As a teen, he was awarded a black belt in judo. He was still partially sighted at that time and said the achievement was possible as he could identify certain people if they were close by him, depending on the light.

Later he took up music and started playing piano before moving on to violin and guitar. "I was able to read music when I was younger because I could enlarge it, but later I mostly played by ear."

Now working as a lecturer in Mathematical Statistics at UP, the husband and father of three said he plans to continue doing research, and learning to read music in braille.

Credit: Article from Sunday Times, by Leonie Wagner



Dr Theodor Loots



Prof Namrita Lall and Mrs Danielle Twilley



Prof Namrita Lall, Dr Navneet Kishore and Mrs Danielle Twilley

Prestigious awards scooped up by Prof Lall and Danielle Twilley

Prof Namrita Lall, from the Department of Plant and Soil Sciences at the University of Pretoria (UP), and one of her PhD students, Mrs Danielle Twilley, were honoured with Biotech Fundi* awards earlier this year.

Prof Lall won the Biotech Fundi Lifetime Contribution Award, which recognises role models who have made a significant and impactful contribution to the development and promotion of biotechnology over a long period. Mrs Twilley received the Biotech Fundi Postgraduate Award, which recognises academic excellence and is given to a postgraduate student who is involved in or is conducting a project that has the potential to become a commercialised innovation in the biotechnology sector.

These were not the only distinguished awards for Prof Lall and Mrs Twilley. As part of a UP team in medicinal plant sciences that also included Dr Navneet Kishore, they won second prize in the GAP Biosciences** category for furthering the development of South African plants into sunscreens and a plant-derived compound that protects against melanoma.

Prof Lall has been placed in the Essential Science Indicators list of the top 1% of citations in the discipline of pharmacology and toxicology. She is internationally recognised for her research into the potential of medicinal plants for pharmaceutical and cosmeceutical purposes, and has made a significant contribution to the field of medicinal plant science. She has obtained several international and national patents, and co-authored about 125 research articles in peer-reviewed journals and eighteen book chapters. A book she wrote on medicinal plants was recently published by Elsevier. The H-index for her research articles is 29

according to Google Scholar and 24 according to ISI Web of Science (<http://www.researcherid.com/rid/A-2635-2012>), and her i10-index is 70. She was awarded the National Research Foundation (NRF) SARCHI Chair in Indigenous Knowledge Systems (IKS) in 2016.

Mrs Twilley's PhD focuses on the use of a semi-pure fraction from a South African medicinal plant and a plant-derived compound to inhibit the proliferation and spread of melanoma. She is further developing plant actives into SPF boosters which can be used in sunscreens for the prevention of skin cancer. She has successfully filed patents in South Africa, Australia and the United States on the potential of a South African plant as a sunscreen ingredient.

Mrs Twilley has won, among others, the 2015 L'Oreal Women in Science Sub Saharan regional doctoral fellowship, 2015 South African Women in Science Award Doctoral Scholarship (IKS), 2014 Best oral presentation at the Annual Indigenous Plant Use Forum, 2011 Margaretha Mes Medal for best Honours student in Plant Physiology/ Biotechnology and in 2011 Best Honours presentation at Fanie de Meillon postgraduate symposium.

** The Biotech Fundi Awards is an initiative of the Gauteng Department of Agriculture and Rural Development (GDARD). Its object is to incentivise, support, promote and develop individuals and companies that make a significant impact on the biotech sector in Gauteng.*

*** The Gauteng Accelerator Programme (GAP) Biosciences Innovation Award is part of the GAP-Biosciences programme, presented by the Innovation Hub and Technology Innovation Agency (TIA) in collaboration with Emory University in Atlanta, Georgia, and sponsored by Pfizer.*

<http://test.theinnovationhub.com/gap/bio-about/>

RMRDT SA awards Hester Vermeulen for her research project

On 24 October 2017 the Red Meat Research and Development Trust South Africa (RMRDT SA) awarded Mrs Hester Vermeulen, a PhD student and her fellow team members, Prof Hettie Schönfeldt and Dr Beulah Pretorius from the University of Pretoria (UP) in the category 'Research project'. The award was bestowed on the team in recognition of the quality of research work done and the exceptional contribution that it has made to the red meat industry in South Africa.

Mrs Vermeulen is a PhD (Nutrition) candidate under the leadership of Prof Hettie Schönfeldt of the Department of Animal and Wildlife Sciences and theme leader at the Institute of Food, Nutrition and Well-being. Her research focuses on investigating the affordability of healthy eating in South Africa with a balanced food basket approach. It also encompasses detailed investigations into the actual staple food and red meat consumption patterns of marginalised, middle-class and affluent consumers. The ultimate goal of the study is to quantify and interpret the gap between ideal and actual food intake.

Mrs Hester Vermeulen is an agricultural economist combining her background in food science (BSc Food Science) with graduate and postgraduate training in agricultural economics and an MScAgric Agricultural Economics to specialise in consumer food and nutrition economics. Fields of interest include aspects such as socio-economic consumer dynamics, consumer behaviour and food choices, consumer trends, food consumption patterns, food affordability and food security and nutrition economics.



Mrs Hester Vermeulen



SACI medal awarded to Dr Lynne Pilcher

Dr Lynne Pilcher from the Department of Chemistry was awarded the Chemistry Education Medal by the South African Chemical Institute (SACI). This is a national award and the highest discipline specific recognition for a contribution to education in the discipline. The award is made to a member of the Institute who has made an outstanding contribution to chemical education, as judged by the person's published work in the previous five years.

Dr Pilcher developed an inquiry-based practical curriculum for third-year organic chemistry that received a Laureate award for teaching excellence and innovation at UP. The article describing this new curriculum was published in the *South African Journal of Chemistry* in 2015 and was the first published example of inquiry-based practical training at advanced undergraduate level in chemistry preceding research projects. Through her passion for seeing students learn and succeed, she developed an understanding for students' frustration with traditional recipe-based practicals, for their fear of failure and for their weaknesses.

At the end of 2012, Lynne Pilcher's application for funding from the Department of Education Innovation to develop a new practical curriculum for third year organic chemistry was successful. Having secured funding, she called together a team to develop the new curriculum. Combining her teaching experience with inputs from Dr Darren Riley who had recently joined the department from industry and Kgadi Mathebata from Chemical Education, an innovative inquiry-based curriculum was developed. They demonstrated that contextualised inquiry-based laboratory teaching afforded an improved quality of learning, made a difficult subject accessible and even popular and to some measure grew the students' ability in all desired UP graduate attributes. This achievement was recognised when the University bestowed a Laureate Award for teaching excellence and innovation on the team in 2014.

She was nominated to represent the Faculty of Natural and Agricultural Sciences and UP at the Teaching Advancement at University (TAU) fellowship programme in 2015-2016

based on her recognised teaching excellence and leadership. The programme was run under the aegis of Higher Education Learning and Teaching Association of Southern Africa (Heltasa) and with the support of the Council for Higher Education. It involved block week units, individual teaching, and inquiry group projects and 50 fellows were drawn from 20 institutions from a wide range of disciplines in a 13-month programme. Dr Pilcher's project involved the study of the introduction of a blended learning teaching approach for first year organic chemistry. She was the only chemist on the programme and was awarded as a TAU fellow.

Dr Pilcher also received an award for "Best paper" at the recent "Flexible Futures" conference on hybrid learning held at the CSIR in September. Her presentation was titled: "Blended Learning: Enhancing student success in Organic Chemistry" and the authors were Lynne A Pilcher, Ina Louw, Lizelle Fletcher and Marietjie Potgieter.



Dr Lynne Pilcher

Research on potatoes lead to many awards for Carmen Muller



Carmen Muller

Over the past year, Mrs Carmen Muller, a PhD student in the Institute of Food, Nutrition and Well-being, has excelled in her research. Working under the supervision of Prof Hettie Schönfeldt and Dr Nicolette Hall, Carmen's research focuses on the diverse qualities and textures of potatoes.

At the beginning of 2017, Carmen was awarded a bursary by the Potato Industry Development Trust (PIDT), through Potatoes South Africa. PIDT bursaries are awarded to students who produce high-quality research that contributes to the South African and global potato sector. Encouraged by Prof Schönfeldt, she successfully applied for the new DTI THRIP funding, which awards and supports excellence in research.

In July 2017, she was awarded the French Inter-professional Organisation for the Potato Fresh Market (CNIPT) bursary. This

enabled her to attend the 20th Triennial Conference of the European Association of Potato Research in Versailles, France, where she delivered two oral presentations on quality aspect of potatoes. She was one of a group of nine researchers from South Africa who represented the local potato industry at the international level.

To round off a highly successful potato research year, Carmen was awarded a TUKS Young Research Leader fellowship (TYRL). This UP programme aims to form a community of like-minded young researchers who possess qualities that will contribute to UP becoming a research-intensive university.

Carmen strives for excellence in everything she undertakes and is passionate about agriculture and the improvement of the South African agricultural landscape.



Food microbiologist appointed as new Head of Consumer and Food Science

Prof Elna Buys

Prof Elna Buys has been appointed as the Head of the newly merged Department of Consumer and Food Science from 1 November 2017.

She obtained her PhD in Microbiology, with specialisation in Food Microbiology, from the University of the Witwatersrand in 2000. She has been involved in teaching and research for the past 25 years.

Prof Buys' research focuses on the animal products, safety and shelf life. She has published widely in ISI journals with high impact factors and she holds a South African patent. She has supervised to completion several master's and doctoral students.

Prof Buys holds a C1 rating from the NRF. She has received research awards from the Agricultural Research Council and the dairy industry for her contributions to research and teaching. She contributes regionally as a food safety auditor of food safety standards and represents South Africa on several International Dairy Federation standing committees.

Prior to this appointment, Prof Buys was Head of Department of Food Science, the focus of which has always been on world class and Africa-relevant food science and technology. This Africa relevance is a strong and powerful interface and in synergy with Consumer Science. Prof Buys' vision for the new Department is precisely to build on these great strengths of the two departments and create a unique Afrocentric food, nutrition and well-being offering that really does meet the needs of the graduates and the people of Africa in the 21st century.

Given the available expertise in the area of food, nutrition and well-being, the new Department will position the Faculty uniquely specifically towards the United Nations Sustainable Development Goals.

Prof Bernard Slippers appointed Director of FABI

Prof Bernard Slippers has officially been appointed as Professor and Director of the Forestry and Agricultural Biotechnology Institute (FABI) from 1 January 2018.

Prof Slippers obtained his PhD from the University of Pretoria in 2003. After that, he was appointed as a permanent, full-time academic staff member in the Department of Genetics (Senior Lecturer from 2003 to 2006, Associate Professor in 2009 and Professor since 2013).

He is a core team member of FABI's Tree Protection Co-operative Programme and Centre of Excellence in Tree Health Biotechnology.

GYA. Prof Slippers is also a Young Affiliate of the Academy of Science of the Developing World (TWAS) and a member of the Academy of Science of South Africa (ASSAF). He leads the development of the Future Africa Institute at UP – aimed at developing excellence in transdisciplinary science leadership for innovation in Africa – as well as its associated Africa Science Leadership Programme.

Prof Slippers and his wife head the residence of TuksVillage, putting him in a favourable position to drive the faculty imperatives of transformation.

Prof Slippers' research focuses on the ecology and evolution of insects and micro-organisms that affect tree health, and the development of tools to mitigate their impact. He uses genetic, genomic and chemical tools to characterise global patterns of spread of invasive tree pests and pathogens, as well as their population dynamics, communication systems and mating strategies.

He has published more than 200 papers, some of which appeared in such high-profile journals as *Science*, *Trends in Ecology and Evolution* and *Trends in Plant Science*. He has also authored a number of chapters in books. Prof Slippers has supervised several postdoctoral researchers, as well as more than 50 PhD and MSc students.

He has received wide recognition for his research, both nationally and internationally, including a B1 rating from the NRF, the UP Chancellor Award 2016, the British Association Medal (Silver) and the JE Vanderplank Award from the Southern African Society for Plant Pathology.

Prof Slippers is a founding member of the Global Young Academy (GYA) and the South African Young Academy of Science (SAYAS). He has served in the leadership of both these organisations, including as co-chair of the



Prof Bernard Slippers

Deputy Dean for Teaching and Learning appointed for another term

Prof Marietjie Potgieter has been reappointed as the Deputy Dean for Teaching and Learning, in the Faculty of Natural and Agricultural Sciences from 1 September 2017. Prof Potgieter is an Associate Professor in the Chemistry Department and served as Deputy Dean since 1 September 2013.

Prof Potgieter has a longstanding record of contributions to Science Education in the tertiary education system. These contributions include research publications within the field, presentations of various lectures at national and international conferences, as well as being elected on national and international bodies representing science education. She currently serves as a titular member of the Committee on Chemistry Education of the International Union of Pure and Applied Chemistry (IUPAC).



Prof Potgieter received the South African Chemistry Institute (SACI) Education Medal in 2008 for her outstanding contribution to Chemical Education, and a national commendation award in 2011 from HELTASA, the Higher Education, Learning and Teaching Association of Southern Africa, for excellence in teaching and learning.

She is the key driver of student success and throughput in the Faculty and has implemented numerous initiatives to empower lecturers to improve their practice and to support students to perform to their full potential. The successes of the previous term include widespread adoption of the hybrid model of teaching and learning, advancement of the scholarship of teaching and learning (SoTL), the implementation of effective student advising, and mentorship of young academics to develop as teachers. She is also driving the FLY@NAS campaign and is a founding member of SCIBER Space (Science-based Education Research), an initiative to support scientists to transition from research in their discipline to becoming established as researchers in science education.

Prof Marietjie Potgieter

Prof Paulette Bloomer to head new Department of Biochemistry, Genetics and Microbiology

Professor Paulette Bloomer has been appointed Head of the newly merged Department of Biochemistry, Genetics and Microbiology from 1 January 2018.

Prof Bloomer obtained her PhD in Zoology from the University of Pretoria (UP) in 1993. Following that, she completed postdoctoral studies, inter alia at the universities of Georgia (Athens, USA), Cape Town (UCT) and Pretoria. She was appointed as a permanent full-time academic staff member in the Department of Genetics in 1999, as a lecturer from 1999 to 2000, as a senior lecturer from 2001 to 2003, then as an associate professor, and finally as full professor from 2010.

She has led the Molecular Ecology and Evolution Programme since 1999. She is a team member of the Centre of Excellence (CoE) in Birds as Keys to Biodiversity at the Percy FitzPatrick Institute of African Ornithology in the Department of Biological Sciences at UCT. She is also a member of the Mammal Research Institute (MRI) and the Genomics Research Institute (GRI) at UP.

Her research focuses on investigating the underlying processes responsible for the creation and maintenance of vertebrate biodiversity, using a GRI phylogeographic and population genetics approach. Current group projects in which she is involved focus mainly on endemic Southern African, African and Western Indian Ocean species, with a particular interest in how species and populations adapt or respond to long- and short-term environmental changes.

Prof Bloomer has published widely in International Scientific Indexing (ISI) journals, including prestigious journals such as *Science*. She has mentored several postdoctoral fellows and supervised more than 40 MSc and PhD graduates. She is an established researcher and holds an NRF C rating. She was a UP Young Outstanding Academic Achiever in 2005/2006. She is as passionate about undergraduate teaching as she is about research.



Prof Paulette Bloomer



Prof Alet Erasmus

Prof Alet Erasmus retires

Prof Alet Erasmus has retired from the University of Pretoria (UP) in 2017 after more than 30 years of service.

She started her career at the University in the mid-1970s as a junior lecturer. She scaled down her career when her children were born but continued as part-time lecturer with involvement across the fields of foods, clothing, nutrition and textiles. She was appointed in a full-time permanent capacity in the 1990s and eventually became more involved in postgraduate teaching and supervision.

Prof Erasmus was appointed as Head of the Department of Consumer Science in 2014, and regard this last period as the most fulfilling in her career. Particularly memorable are the collegial interaction, the realisation of an academic's role as mentor in student lives — especially postgraduate students, as well as an understanding of the trust that the University bestows upon colleagues in leadership positions. It has been a highly rewarding experience for her to be part of the Department of Consumer Science, and to be associated with the Faculty of Natural and Agricultural Sciences at UP.

Her curiosity about consumer behaviour in the market place, household technologies and consumer handling of complex purchase decisions directed her research interest, which, to this day still excites and drives her research endeavour. Prof Erasmus was the first South African to join and present

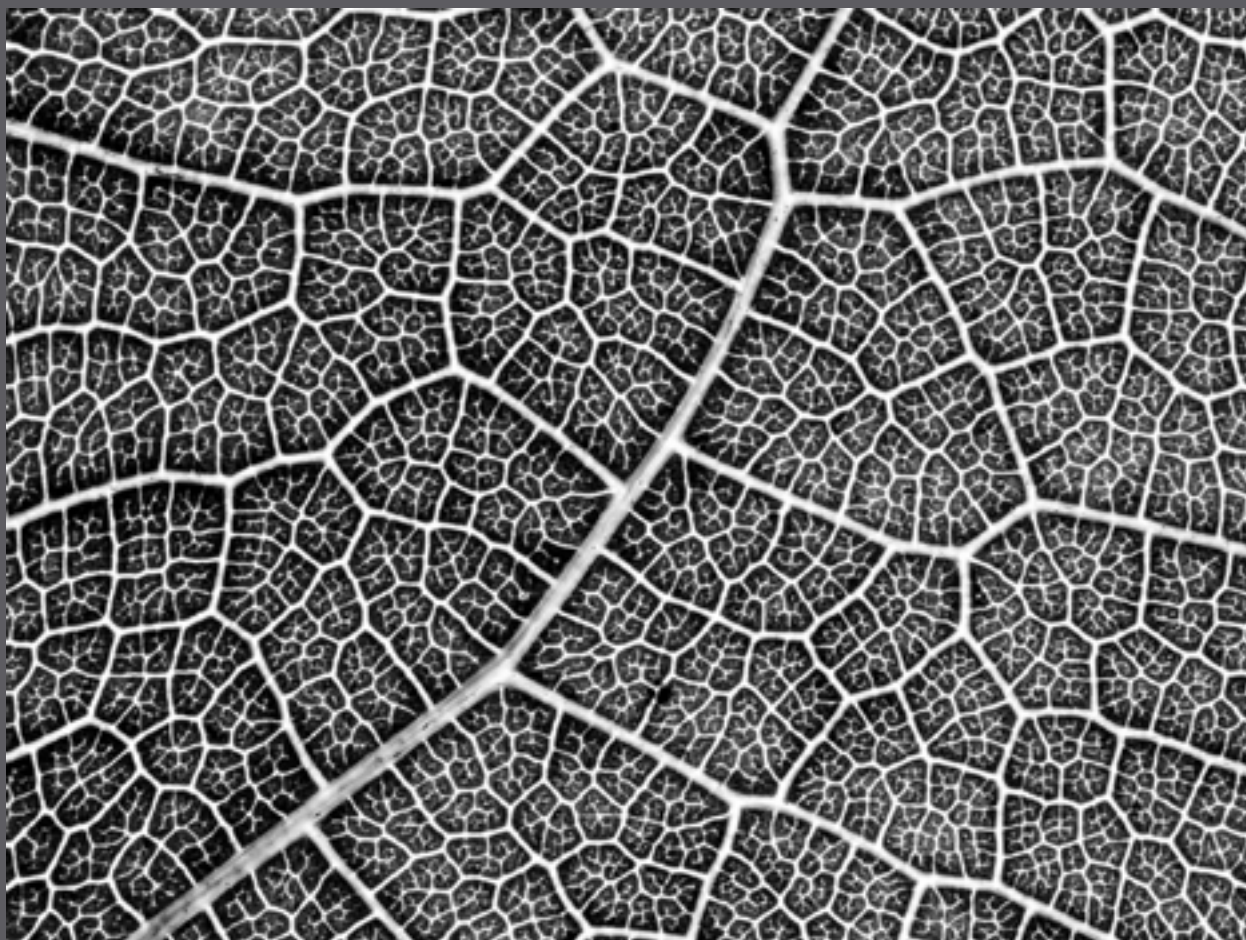
her research at the renowned Association for Consumer Research in 2000, which led to invaluable contacts that further inspired her career. She also serves on the editorial board of the *International Journal of Consumer Studies* and edited a special edition in 2012. Prof Erasmus delivered 29 master's and 5 PhD students, plus approximately 65 publications in accredited journals. As an NRF C2-rated researcher she understands the challenges facing South African academics in Consumer Science locally and globally, and wishes colleagues all the best for the future.

Mathematics hosts exciting photo competition

The Department of Mathematics and Applied Mathematics held a photography competition this year, with the theme *Mathematics in Nature*. The competition was open to all and numerous entries from students and staff flooded in. The photos were judged by a panel. The competition closed on 1 August 2017 and the following winners were announced: J Jonkman with "Circular motion" won first place; and "Turn over a new leaf" by L Bennett took second place, while R Jafer scooped up third place with "The perfect number".

Circular motion





Turn over a new leaf

The perfect number



Passing of Prof George Djolov

It is with deep regret that we announce the unexpected passing of a colleague and friend, Professor George Djolov, a meteorologist and extraordinary professor in the Department of Geography, Geoinformatics and Meteorology.

George was born in Bulgaria and later travelled and studied extensively. His life was characterised by a diverse and distinguished career in academia. For his studies in Canada and Russia, George received two doctoral degrees, the first in physics and mathematics, and the second in mechanical engineering. In the period leading up to 1990, he served as Professor of Physics at the Bulgarian Academy of Sciences, founded the Institute of Ecology for the Bulgarian Academy of Sciences, served as Senior Advisor on Environmental Problems to the office of the Bulgarian State President, and was Chair of the *World Federation of Engineering Organisations* (WFEO) Committee on Engineering and the Environment. During this period George also had a close working relationship with the Energy and Climate Task Force of the International Institute for Applied Systems Analysis (IIASA).

An extraordinary period followed in Southern Africa. George first served as co-ordinator of the BTech Programme in Applied Physics at the University of Zimbabwe. In 1996 he was appointed as Professor and Chair of Physics, and thereafter Dean of the School of Mathematics and Natural Sciences at the University of Venda. In 2003, the University of the North (now Limpopo) appointed George as Professor and Director of the Faculty of Physical and Mineral Sciences. Until 2006 he then served as CEO of the National Community Water and Sanitation Training Institute in Polokwane (then Pietersburg).

After his formal retirement, Professor George Djolov joined the University of Pretoria as a meteorologist and Extraordinary Professor in the Department of Geography, Geoinformatics and Meteorology in 2007. George continued to be highly active over the next decade. The meteorology programme was taught by him and he published and supervised postgraduate students in his preferred fields of meteorology, namely theoretical and numerical geophysical hydrodynamics, atmospheric physics and boundary layer dynamics, climate change, air pollution modelling and environmental physics. During his time in Africa he raised in excess of R17 million in research grants, co-authored and/or published four books and more than 100 journal articles. In 2015, the International Eurasian Academy of Sciences honoured George for his distinguished career and contribution to science.

Over the past three years he managed the University of Pretoria's Laboratory for Atmospherics Studies. While liaising with industry, his primary role supported research and student supervision in the field of air quality management. George was more than a colleague at the University of Pretoria. He was a statesman for academia and for many also a friend and confidant. Always humble, he established an astounding rapport with his students and colleagues, and will be severely missed by all.

George is survived by his spouse Elsabe, his sons George junior and Vladimir and their children Embeth and Yonna, and his great-grandchild Monika.



Ms Yvonne McDermot

Final farewell to Ms Yvonne McDermot

Ms Yvonne McDermot, former staff member of the Department of Mathematics and Applied Mathematics, passed away on 14 November 2017 after a long battle with health related issues.

Yvonne was a First Technical Assistant in the Department for more than 38 years until her retirement on 31 January 2015. She was a caring and selfless person who would be willing to walk the extra mile for any staff member or student.

She is fondly remembered by colleagues for her unique personality. Yvonne was meticulous in her work and could take one glance at a document and immediately spot the error that everyone else had overlooked. She could deal with a number of matters simultaneously while keeping a level head. Her institutional knowledge of Tuks was admirable and she could cite phone numbers, rules and regulations off by heart. If she did not have the knowledge at hand she could lay a finger on the appropriate file in no time at all. She was inquisitive by nature,

interested in people and events, systems and processes, drawn to knowing detail. Yvonne was responsible for postgraduate affairs in the Department but her impact reached much wider.

Her health deteriorated after retirement and although she put up a valiant effort, she sadly lost the battle. She was supported by a strong circle of family and friends.

May she rest in peace!



Decades of subantarctic research documented

Pain forms the character documents a journey through decades of extraordinary subantarctic environmental research and wilderness adventure. It captures the nostalgia, and the blood, sweat and tears of those who have worked on Marion Island, midway between South Africa and Antarctica, home to a flourishing, globally recognised seal research programme under the auspices of the University of Pretoria's Mammal Research Institute (MRI). The book reflects what the substantial scientific output and conservation benefits do not: how the lives of many people were influenced through participation in the endeavours on Marion and several other Southern Ocean islands. *Pain forms the character* tells the stories of those who have been fortunate enough to spend time in this pristine environment with its unique inhabitants.

Scientific research on Marion and Prince Edward islands commenced in earnest during the first South African Biological and Geological Expedition to the island group in 1965–1966. The 450-page book gives a first-hand account of the 'cat hunters' and 'sealers' of Marion Island – the stories of those who worked with the colourful and enormously influential 'Doc' Marthán Bester, professor at the University of Pretoria.

Prof Nico de Bruyn, from the MRI and a former student of Prof Bester, is the principal investigator of seal and killer whale research, collectively managed as the Marion Island Marine Mammal Programme (MIMMP). Prof Bester, who started the seal programme and is now heading into retirement, remains actively involved as co-investigator of the programme.

The book started when Prof De Bruyn collected information for a small, personalised book with a few thank you notes from cat hunters and sealers in acknowledgement of the work done and the legacy built largely by Prof Bester. This escalated into an enormous project encapsulating the legacy of all those involved in these efforts since the inception of the programme. Prof De Bruyn and Dr Chris Oosthuizen (postdoctoral fellow, MRI) compiled and edited all material and produced this book as a dedication, not only to Prof Bester, but to all who have worked in these unique programmes.

The title, *Pain forms the character*, is a saying coined by Prof Bester, used throughout the years to motivate and inspire both cat hunters and sealers. It also encapsulates the extraordinary

lengths to which all have gone in pursuit of knowledge and conservation. The phrase is dotted throughout the anecdotes in the book.

In the foreword, Polar Medal recipient, Chief Scientific Adviser for Food and Rural Affairs to the UK Government and professor of Biology at the University of St Andrews, Prof Ian Boyd, writes the following: 'The 1980s were a great time to be doing field science in the Southern Ocean, and especially on animals like seals. Marine mammal science was in transition at that time from an activity that happened in conjunction with harvesting or culling of marine mammals to one that was standing up for itself as a field that was asking fundamental questions in ecology. It was finding its feet and competing successfully for funding in its own right and I, with Marthán Bester and others, were part of a group of scientists from around the world who were brought together by the common interest in studying the structure and function of Southern Ocean ecology as seen through the window of marine mammals. These species cast light on this complex system that could come from nowhere else. Marthán has been one of the pioneers. Most of us came together between extended and sometimes gruelling field work for regular meetings under the auspices of the Scientific Committee on Antarctic Research Group of Specialists on Seals. This group had been built out of the need to ensure sealing activities in the Southern Ocean were supported by sound scientific advice.'

Prof Nico de Bruyn



Fortunately, sealing is a thing of the past and the group found a new function around the coordination of the scientific research being carried out on seals by various nations. The Marion Island studies were an essential part of this mix, and the long-term population studies of elephant seals, in particular, became one of the globally important examples of long-term studies of large mammals. These delivered huge leaps forward in our understanding of population processes in large mammals during the latter decades of the 20th century.

Keeping long-term studies going requires vision, tenacity and leadership, and Prof Marthán has these qualities in abundance. But it also requires mutual support among a small international community of scientists, and Marthán has always been there to support the wider cause. New ideas and techniques would be shared, and data were pooled to help provide a synoptic view of the state of the ecosystem. All this contributed to the building of what is now a very effective system for monitoring the state of the Southern Ocean ecosystem through the changing performance of the predators at the top of the food chain.

A brief overview of how expeditions to Marion Island work

Every year, around the end of March, the *SA Agulhas II* heads down to subantarctic Marion Island. The voyage to the island takes about five days, traversing some of the fiercest waters in the world. The outbound ship will have on board a new (overwintering) expedition team, a host of scientists and their collaborators and students, officials from the Department of Environmental Affairs (DEA), and personnel from the National Department of Public Works – nearly 100 individuals in addition to the ship's crew. During the 'takeover' or 'relief', a five-week period that generally spans the whole of April, the base station is a crowded place as research programmes are fine-tuned, new personnel are trained, the base station and field huts are maintained and stock is consolidated. During this time, the ship is involved in oceanographic research in the regional waters before returning to the island in early May for back-loading, bringing the crowded takeover period to an end. The ship returns to South Africa, leaving only the new expedition team at the island until the next year's 'takeover'. Every annual expedition team remains at Marion Island for about 13 months.

Pain forms the character

Doc Bester, cat hunters and sealers

Compiled and edited by Nico de Bruyn and Chris Oosthuizen

Visit: www.marionseals.com/shop/

ISBN 9780620749121

Price: R650

Collector's edition numbered copies: R900

All proceeds from the sale of the book go to the seal research programme.

Credit: Prof Nico de Bruyn and Tukkie

Seven African countries show how battle against malnutrition can be won

A number of African countries are taking bold action to tackle malnutrition. They have successfully implemented a range of actions that have started to improve nutrition for all.

Good nutrition contributes to cognitive development, better opportunities for children to realise their potential and higher earnings later in life. This in turn supports macro-economic and societal growth. Poor nutrition, on the other hand, impairs productivity and acts as an impediment to national growth.

In the past, Africa and its development partners have focused almost exclusively on tackling undernutrition caused by diets that are low in calories. But there is now broad consensus that attention to micronutrient deficiencies and obesity need to be a priority too.

The recently released Malabo Montpellier Panel's report, on how Africa can build a future free from hunger and malnutrition, presents a seven-country case study. It sets out how Senegal, Ghana, Rwanda, Angola, Cameroon, Ethiopia and Togo significantly reduced undernourishment, child wasting, stunting and mortality over the past 16 years.

The report explains the institutional arrangements, programme interventions and implementation plans that enabled countries to reduce child undernutrition significantly. The findings show that the choices made at both the macro (policy) level as well as at the household level had a direct bearing on nutrition outcomes. It offers a roadmap of 12 policy priorities that African governments can follow to deliver on the nutrition targets set out in the Sustainable Development Goals.

The report is a product of the 17-member panel of experts that identified areas in which African countries are making progress on the ground. The panel also tried to understand what works, why and how. The report offers practical, evidence-based advice on policies, programmes and interventions.

Not just a health issue

Some of the countries discussed in the report initially had high rates of malnutrition. But they have made remarkable progress in child nutrition.

One contributory factor is that countries started implementing multi-sectoral programmes rather than just relying on the health sector. In

some cases this has involved creating units specially for the purpose of reducing malnutrition levels.

Take Senegal. A unit called the Cellule de Lutte contre la Malnutrition was set up in the prime minister's office. It provides technical help in defining and implementing national nutrition policy. Similarly in Rwanda, the national nutrition policy is led by an inter-ministerial committee based in the prime minister's office. Other ministries are also starting to assume greater responsibility, particularly agriculture, often in cooperation with the private sector. In Cameroon a National Council on Food and Nutrition was set up eight years ago. It's directly linked to the office of the president and has implemented a food security and nutrition policy.

At about the same time Angola established an interdepartmental committee for food security. This is made up of 19 ministries and chaired by the secretary general of the prime minister's office. The aim has been to create a network of "parliamentarians for the fight against malnutrition."

These inter-disciplinary approaches differed across countries. But they all also included tried and tested interventions. These included early detection and treatment of at risk children, promotion of breastfeeding, vitamin supplementation, fortification of foods, home production, school feeding programmes and social grants. They also almost all exploited new developments in technology such as sharing nutrition knowledge through cell phones.

But more needs to be done. Concerted action is needed on a wide range of policies and practices, including institutional reforms, strengthening national agricultural and nutrition research and better data.

Key policy lessons

Some of the key lessons from the seven case study countries included:

- Adopting a comprehensive policy on nutrition as a top priority and integrating these elements across sectors.
- Designing programs that capture the synergies between agriculture, water, health and sanitation.
- Establishing a high-level coordination system for visibility and accountability.



From left: Sir Gordon Conway (Professor of International Development at Imperial College London), Dr Tom Arnold (Director General for the Institute for International and European Affairs), Nachilala Nkombo (Interim Africa Executive Director for the ONE Campaign), Prof Joachim von Braun (Co-Chair of the Panel and Director of the Center for Development Research (ZEF), University of Bonn), Dr Ousmane Badiane (Co-Chair of the Panel and Africa Director, International Food Policy Research Institute), Dr Agnes M Kalibata (President, the Alliance for a Green Revolution in Africa), Her Excellency Tumusiime Rhoda Peace (Former AU Commissioner for Rural Economy and Agriculture at the African Union Commission), Dr Wanjiru Kamau-Rutenberg (Director of African Women in Agricultural Research and Development), Prof Sheryl Hendriks (Director of the Institute for Food, Nutrition and Well-being, UP) and Dr Debisi Araba (Africa Director, International Center for Tropical Agriculture).

- Creating a broad and inclusive partnership with stakeholders from the public, private and civil society sectors.
- Strengthening food-system regulation and controls to increase the supply of safe and nutritious food while investing in the distribution of affordable and healthy foods for the poor.
- Investing in crisis prevention and emergency intervention capacity to address the threat of conflict. This is an ongoing concern in Africa that adds an element of fragility and swells the number of people relying on humanitarian aid. This in turn detracts countries from development focused investment.
- Building resilience by investing in programmes that protect the nutritional status of vulnerable populations during extreme weather events.

The case studies show that African countries that go beyond simply increasing the amount of food produced to making actual improvements in the quality and provision of nutritious foods can make a significant contribution to improving nutrition levels. This is particularly true if vulnerable groups are targeted. And if a range of sectors are involved.

About the authors:

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Unravelling the mysteries of meerkat behaviour

Meerkats are fascinating animals that display intricate social behaviour. They live in groups of between four and 35 individuals and each group is governed by a dominant breeding pair that sires up to 90% of the surviving offspring. Other individuals in the group are subordinate to the dominant individual of the same sex. Subordinate mammals display high levels of co-operative behaviour, helping in pup raising and feeding. Despite their co-operative behaviour and assistance in things like pup-feeding and babysitting of the dominant pair's offspring, the dominant female is aggressive towards subordinates, causing high levels of stress among the subordinate females.

Researchers at the University of Pretoria (UP) form part of the Kalahari Meerkat Project (KMP) in the Northern Cape's Kuruman River Reserve, which has studied groups of wild meerkats for over 20 years. This project was started by Prof Tim Clutton-Brock, extraordinary Professor at UP and director of research of the Department of Zoology at the University of Cambridge. The KMP is a collaboration between the University of Cambridge, the University of Zurich and the UP Mammal Research Institute (MRI). It is managed in South Africa by Dr David Gaynor of the MRI and is focused on better understanding co-operative behaviour in these animals in order to gain greater insights into the social structures of mammals.

Recent studies within the project have focused on gaining novel insights into the maintenance of co-operative behaviour. UP researchers from the MRI, including Prof Nigel Bennett, and Prof Andre Ganswindt, Director of the MRI, in collaboration with other researchers in the KMP, simultaneously investigated multiple social,

environmental and individual factors that affect stress levels of subordinate meerkats.

The study explored whether conflict between dominant and subordinate meerkats affect alloparental care by altering the levels of the stress hormone cortisol. This was assessed by looking at how the stress hormone cortisol affects assistance from subordinates with pup-feeding and babysitting, and what role food availability and other characteristics of the social group play in the levels of stress hormones in subordinate meerkats. By assessing stress levels in these different scenarios, more insight was gained into social conflicts and the cost of co-operation.

While both male and female subordinates endure higher levels of stress than dominant meerkats, it appears subordinate females display the highest levels of cortisol in their plasma, suggesting stronger competition between members of this sex. Cortisol is a hormone involved in the regulation of metabolism in cells and helps to handle stress within the body. It is part of the group of hormones known as glucocorticoids. Through observations and by measuring glucocorticoid levels, it was evident that dominant females exert a lot of aggression on other females. Findings show very high levels of aggression directed to subordinate females when the dominant female is pregnant. Previous studies conducted by the KMP suggest that this is because the subordinate pups compete with the pups of the dominant pair and subordinate females may kill these pups to favour the survival of their own. It appears that dominant females avoid this by evicting older subordinate females from the group before giving birth. In all these instances, it was found that

Photo credit: Kalahari Meerkat Project



subordinate females experienced escalated glucocorticoid levels in their systems.

Based on these findings, the KMP evaluated whether dominants direct aggression strategically to manipulate cortisol levels to increase the co-operative behaviour of subordinates. Their findings, however, do not show this to be the case. Although cortisol levels significantly affect participation in co-operative behaviour, it is not in a simple consistent way. Low levels of cortisol increased babysitting behaviour among subordinates of both sexes. For pup feeding, high levels of cortisol increased this behaviour in subordinate males, while low levels of cortisol receptor activity resulted in increased pup feeding among females. Dominant female meerkats did not adjust

their levels of aggression to strategically enhance co-operative behaviour among subordinates. It appears that the function of aggression directed at subordinates is predominantly to stop them from breeding rather than to force them to co-operate.

By gaining greater insights into the social structures and behaviours of meerkats, Dr Gaynor and the KMP hope to improve future conservation practices of wildlife populations. The project continues to follow about 300 meerkats in the reserve on a daily basis, enabling the project to provide detailed information on how interaction between individuals lead to higher stress levels, and to measure the effect of different individual behaviours on the lifetime reproductive success.

Photo credit: Kalahari Meerkat Project



Volunteers working with the meerkats at the Kalahari Meerkat Project



Forests are living on the edge – and this is not a good thing

Forests are living habitats that contain life in all its incredible forms. Towering trees create canopies that are home to an array of species – many of which are found only in the forests they occupy. The forest floor is a traffic zone of insects and animals creating nutrients for plants to use. Many forest plants have medicinal value and serve local communities living in surrounding areas. Forests, however, are under threat. Logging companies, mining companies, agriculture, illegal hunters and poaching, as well as the development of roads and other infrastructure are fragmenting forests.

In South Africa alone, 82% of coastal forests have been lost and 85% of species' abundance living in forests across the world are said to be impacted by forest fragmentation. Forest fragmentation is the breaking up of large forests into smaller, more isolated versions that are "hemmed in" by human land-use types (matrix habitats). Remaining fragments are then also exposed to edge effects associated with these matrix habitats. This is not a good thing as fragmentation of forests impedes the creation of a diverse range of niches available, reducing places for species to forage and breed, resulting in a loss of species.

In South America, for example, army ants need large areas of forest to roam, with flocks of insectivorous birds following them. The fragmentation of the Amazon means that many areas cannot harbour these colonies of ants anymore, and

many associated bird species have also vanished.

Dr Pieter Olivier from the Department of Zoology and Entomology is part of an international collaboration looking at how forest edges have a global impact on forest vertebrates by collecting data of over 1 500 forest vertebrates. The team's work was recently published in *Nature* and highlights how biodiversity is changing as a result of deforestation – forcing some species to the brink of extinction while others flourish in the changing environment.

A forest edge is the interface between forests and non-forest areas. Olivier explains that edge effects create new habitats that are much harsher than the interiors of a forest. They tend to be hotter and dryer, with more exposure to light. This causes a change in vegetation type and introduces more pioneer and invasive species. The study collected data from fragmented landscapes worldwide to investigate how forest edges affect the abundance of species. One thousand six hundred and seventy-three species of mammals, reptiles and amphibians were analysed to see how they respond to edges. Often, as a result, forest core species are pushed back by these new and invasive species, creating a scenario of winners and losers. Olivier explains the importance of conserving core species because they cannot survive anywhere else. What makes the conservation of these species even more sensitive is that they are usually quite rare already, so any small change can have



a very dramatic and often devastating effect on them. Edge species, however, tend to be tougher and can survive in most habitats.

This international study, led by world expert in forest fragmentation Professor Robert Ewers of Ecology at Imperial College London, is a first-of-its-kind study using new spatial and statistical analyses that combine data from across the world, creating a metric of fragmentation effects on each forest species. What makes the international collaboration exceptional and quite different to traditional fragmentation studies is that it modelled an entire landscape, determining edge effects in every specific scenario across the selected landscape. Traditionally, fragmentation studies were only able to determine whether edge effects were high or low. This model is able to determine whether edge effects are high or low and every variable in between. A diversity of forests from across the world was studied, from rain forests such as the Amazon to coastal forests found in South Africa. The study was able to get very accurate and comprehensive results that were modelled on 22 landscapes from across the world.

As expected, the effects of forest edges on species can be quite varied. The study explains that half of the world's forest habitat is now within 500 metres of a forest edge due to the expansion of road networks, logging, agriculture and other human activity.

Obviously, nature reacts best to nature and when forests are surrounded by natural grasslands or woodlands the edge effects appear to not be as severe as when surrounded by sugar canes and plantations. In the first case scenario forest species tend to be unaffected and so edge effects tend to go unobserved. When these habitats are transformed into stark human-modified habitats then high contrasts and strong edge effects are observed.

Prior to Olivier's study, there were no records on the history of South African coastal forests and where they once occurred. In order to establish how much of these forests have been

lost, Olivier developed a model indicating where forests would typically have been in South Africa by looking at the conditions of existing forests in the country and matching similar conditions elsewhere. Areas with similar climatic conditions that would most likely have been coastal forests in bygone years are now typically plantation forests and sugar cane. From this model, Olivier was able to determine that 82% of South Africa's coastal forests have, in fact, been lost.

Olivier sampled birds and trees inside these fragmented forests to see if the size of the forest or the habitat that surrounds the forest affects the composition of these species. Without varying niches available within the forest, a decline in species is observed. He specifically noticed a decline in insectivorous birds. The simplified structures that are fragmented forests probably harbour impoverished insect communities, resulting in a decline of several associated species.

While most forests across the world seem unable to escape the destruction of human activities, South African coastal forests are in a fortunate position as most remaining forests are found in protected areas, such as the iSimangaliso Wetland Park. Because of this protected state, Olivier is hopeful that these forests will not be fragmented or degraded further.

The mining company RBM has been mining sand dunes along the KZN north coast, since 1979. However, during the early 90s, they initiated an extensive rehabilitation program that is now the longest-running rehabilitation program in Africa. Some of Olivier's research done on these rehabilitating forests suggests that they are recovering the structure, composition, and function that are associated with undisturbed coastal forests in the region, which is good news for species that depend on coastal forests to survive.

The international team of researchers intend to continue in their efforts to ensure optimum protection of forests. Their work continues to look at impacts on biodiversity caused by forest loss and fragmentation, specifically looking at how best



The forest team (from left): Dr Pieter Olivier, Dr Pfeifer (lead author of the Nature paper), Mr Thabani and Mr Marc Freeman

to preserve forests, addressing global-scale isolation and area effects.

Global-scale isolation looks at the distance that fragmented forests are from each other and whether species are able to move between them. Area effects compare fragment sizes. Future plans of the research team are to determine whether it is correct to expect that as fragment size increases so does the number of species. Is a small fragment a subset of a larger one and how do species utilise space within these areas? Is it better to conserve one large fragment because more species exist there or should all fragments, irrespective of size, be conserved? This team plans to find these answers.

The study has already provided useful information for land management, with this model serving as a valuable tool to guide conservation efforts. The next step of the study will use this data and software to allow managers to create “optimal landscapes” that combine forest use with biodiversity conservation, explains Ewers.

Someone once said that if you walk in a forest you will lose your mind, but find your soul. Forests are therapeutic,

rejuvenating and inspiring for the soul, but more than this, there is a wider responsibility to save the forests of the world.

Even city dwellers that are far removed from forests have an obligation to care about the state of the world’s forests. The protection of forests affects everyone. If forests are fragmented or destroyed, we lose a fundamental source of carbon storage potential. Global warming and drastic effects on climate change will be the inevitable result for us all.

Another bit of good news is that there is an extensive rehabilitation of coastal forests after dune mining. The mining company RBM has been mining sand dunes along the KZN north coast, since 1979. However, during the early 90s, they have initiated an extensive rehabilitation programme that is now the longest-running rehabilitation program in Africa. Some of Dr Olivier’s research done on these rehabilitating forests suggest that they are recovering the structure, composition, and function that are associated with undisturbed coastal forests in the region, which is good news for species that depend on coastal forests to survive.

Photo credit: LAI surveys, Prof Pieter Olivier and Prof Robert Ewers

Geology and Master Drilling break new grounds through scientific drilling collaboration

This year, the Department of Geology and Master Drilling, a South African drilling company that operates internationally, sunk a scientific borehole on a farm in Griqualand West, in the Northern Cape.

The Head of the Department and Kumba-Exxaro Chair, Prof Wlady Altermann, acquired a scientific borehole close to a dry river bed containing unique examples of preserved pahoehoe lava flow structures within the more than 2 000-year-old Ongeluk Formation, north of Prieska.

With the help of Kumba Iron Ore, Prof Altermann approached Master Drilling in early 2017 to sink a cored hole through the Ongeluk lavas and the Magkanyene Formation, into the underlying Koegas Formation. This sequence of 2,4 to 2,2-billion-year-old rocks contains information on climatic and depositional changes during a poorly understood period of global ice age and deposition of Iron Formations and volcanic rocks. The Makganyene glacial deposits witnessed one of the most profound climate change events in the Earth's history, approximately 2,4 billion years ago, which led to a shut-down of oceanic circulation and to the freezing of the Earth and its oceans. Fresh core samples will help scientists investigate these processes, which were followed by a significant rise in atmospheric oxygen and a dramatic decline in CO₂ levels. The information they gather could prove invaluable to scientist studying climate change today. The drilling is also expected to improve the stratigraphic correlations across South Africa and to have economic implications which may aid knowledge on the mineral-bearing potential of these formations.

According to Prof Altermann, this collaboration is one of the first of its kind between the mining industry and a South African university. It was driven, planned, funded and executed utilising exclusively local expertise. Master Drilling readily agreed

to support, manage and fully fund this endeavour. The project created opportunities at the University of Pretoria for PhD, MSc and BSc research on the recovered core, in collaboration with leading South African and international scientists. Similar and larger scientific drilling programmes, such as the drilling through Karoo rocks by the CIMERA DST-NRF Centre of Excellence (of which our Department is a member), were dependent on international funds. The funding of the project by Master Drilling is a good example of local industry involvement in basic and applied science. For now, the core, which contains yet-to-be-discovered secrets of the Earth's history, is safely stored until it can be analysed by a team of researchers and students from the global geological community.

Front: Prof Wlady Altermann and Eric Mongameli (scribe). Second row standing: Shadrock Motloutng (Supervisor), David Murigwathoho (Operator) and Piet Noeth (Framer). Back: Lucky Khumalo (Operator)



CAPE CITIZEN SCIENCE engages more than 200 youth in 2017

Joey Hulbert, a PhD student in the Department of Plant and Soil Sciences at the University of Pretoria (UP), and an affiliate research student in the Department of Conservation Ecology and Entomology at Stellenbosch University, engaged more than 200 young people during 2017 in his citizen science programme called ***CAPE CITIZEN SCIENCE**.

According to Joey, “coordinators of the project identified our curiosity as our ‘inner scientist’, and one major objective of **CAPE CITIZEN SCIENCE** during 2017 was to help youth release that ‘inner scientist’. In 2017, additional outreach grants from two international plant disease societies, the Mathre Education Endowment Award from the American Phytopathological Society, and the Plant Pathology Promotion Fund of the British Society of Plant Pathology, allowed the project to focus on youth engagement this year. These grants have been used to fund ten activities that engaged youth in the **CAPE CITIZEN SCIENCE** project.

More than two hundred youth participated in **CAPE CITIZEN SCIENCE** through four novel partnerships. Many of the youth were part of after-school learning programs, such as the South African Education and Environment Project in Cape Town, and Vision Afrika in Kayamandi. Additional activities were organised with the SANParks

Junior Rangers and the Cape Nature Junior Rangers. Each activity was led in different areas to broaden scientific discoveries facilitated by the **CITIZEN SCIENCE** activities.

Youth citizen scientists participated as “pathogen hunters”, searching for diseased plants in the natural areas of the Western Cape Province. These activities were the first experiences in nature for many of the learners, and their first practical introduction to the microscopic world. Organisers of **CAPE CITIZEN SCIENCE** are grateful for the support they have received in order to provide these opportunities, and hope to continue providing similar experiences in 2018.

The goal of **CAPE CITIZEN SCIENCE** was to engage the public in Joey’s PhD research about the population genetics of *Phytophthora cinnamomi* and the phylogenetics of the *Phytophthora* genus in the fynbos biome of South Africa.

CAPE CITIZEN SCIENCE was initiated in collaboration between the Forestry and Agricultural Biotechnology Institute at UP and the Department of Conservation, Ecology and Entomology at Stellenbosch University.

***CAPE CITIZEN SCIENCE** (<http://citsci.co.za>)

Joey Hulbert engaging with learners



Going with the flow – building a local pharmaceutical manufacturing platform

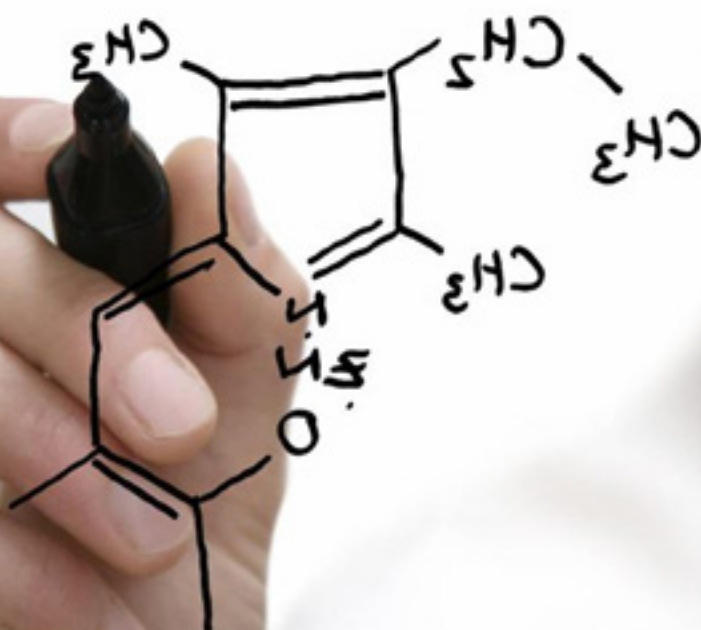
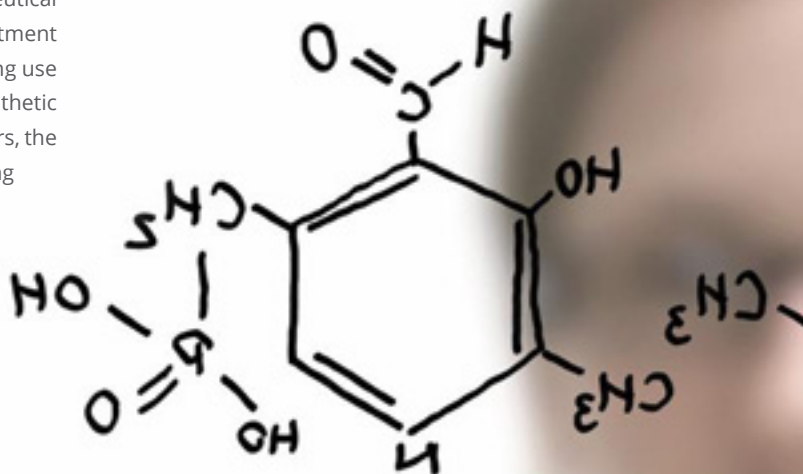
The pharmaceutical industry must continually aim to develop new and innovative treatments for diseases, but at the same time drugs not only need to be readily available to those in need, but must also be affordable. The industry itself is somewhat of an enigma within the scientific community in that, although there has been exponential development in the field over the past century, the methodologies behind the science have remained essentially unchanged. Synthetic chemistry, on both small and large scales, has become reliant on batch-by-batch processing technologies that are in some respects both antiquated and inherently inefficient.

As part of the Department of Science and Technology's Ketlaphela programme, which was introduced to establish a local pharmaceutical manufacturing presence, a team of researchers in the Department of Chemistry under the supervision of Dr Darren Riley is making use of continual flow energy to challenge the way in which synthetic chemistry is applied. By utilising various different micro-reactors, the technology allows reactions to take place continuously in flowing streams, which could be described as a production line for the manufacturing of chemicals. This technology offers several advantages over traditional batch processing and is generally associated with improved yields, reduced reaction times, greener processing, safer operating conditions and, most critically, is essentially directly scalable from the bench to the plant.

The group has successfully demonstrated the strength of the technology, both as a tool to aid early-stage drug discovery, in which case Alzheimer's

disease is being targeted, and as a process-development tool. With regard to the latter, the group has successfully developed processes for the synthesis of several pharmaceuticals, including Celecoxib, Clozapine and Fluoxetine, all of which show significant advantages over the traditional batch routes.

This work was supported by the Department of Science and Technology (DST), the National Research Foundation (NRF), Pelchem Pty Ltd and Ketlaphela.



New state-of-the-art research equipment in Department of Physics

The Carbon Based Nano Materials Research Group in the Department of Physics led by Prof Ncholu Manyala recently received state-of-the-art equipment. The results obtained by means of this equipment could be used for publications in scientific journals of high standing (ISI) and of interest to the broad scientific community. Prof Manyala is also the incumbent of the SARChI Chair in Carbon Technology and Materials.

The equipment includes a WITec alpha300 RAS+ system, Confocal Raman Microscope with Integrated Atomic Force Microscopy (AFM), Scanning Near-field Optical Microscopy (SNOM), photoluminescence and nanolithography. Among others, the equipment has the following capabilities:

- High resolution, ultrafast Raman imaging with an acquisition time of below 1 millisecond for a single Raman spectrum
- 3D Confocal Raman Imaging with special resolution down to 200 nm and able to reveal the distribution of chemical compounds, material stress, and crystallinity.
- Raman Spectroscopy and Micro-Raman Measurements
- Nanoscale surface characterisation-AFM: Contact Mode, AC (Tapping) Mode, Lateral Force Mode with no sample preparation and easy to use in air and liquid
- Optical imaging beyond the diffraction limit-Scanning Near-Field Optical Microscopy (SNOM) which gives an optical resolution in the range of 50-100 nm, higher than normal confocal optical microscopy where resolution is limited by diffraction
- Nanolithography for patterning and fabrication of nanodevices such as the Field Effect transistor (FET)

This equipment will also connect the new research level materials with initial device manufacturing and tests, providing detailed feedback to the materials development process and paving the way for interaction with industrial partners. Most importantly, this equipment will be used to facilitate the interplay between national and international laboratories, notably those at universities where the focus is on research and the training of young researchers and postgraduate students.

In the current global research, nanomaterials have received much attention for numerous practical applications, but only after they have been well characterised and understood. In Prof Manyala's group, the equipment will be used to advance the understanding of synthesised carbon-based nanomaterials used in flexible transparent conducting electrodes for solar cells, conducting electrodes for supercapacitors and hybrid lithium ion batteries required for today's energy storage challenges, as well as for gas/chemical sensing.

In terms of multi-disciplinary research that serves the broader community, the equipment can be used in the following disciplines:

- Materials Science and technologies: Nanostructured surface inspection, defects and residues analysis, surface modification and stress measurements.
- Nanophotonics: Waveguides, imaging of surface plasmon wave and surface enhanced Raman Imaging (SERS).
- Biochemistry: Chemical imaging without the need for fluorescent dyes, imaging of cells, tissues and bio-films, monitoring of metabolic activities, high-resolution fluorescence imaging, and nano-biomedical studies.
- Pharmaceuticals, Cosmetics and the Food Industry: Drug distribution and product homogeneity investigation, solid state and foreign particulate analysis, and polymorph characterisation.
- Forensics: Fibre analysis, analysis of writing, and printing on documents and residue characterisation.
- Geoscience: Petrology, identification, and distribution of minerals, characterisation of organic and inorganic components, fluid inclusion, geo(micro)biology and astrobiology.
- Semiconductors and photovoltaics: Large area wafer inspection, defects analysis, stress measurements and layering.



Prof Ncholu Manyala

Colour run for oriental fruit flies

Fluorescent pigment powders can be used to mark oriental fruit flies for field experiments and sterile insect releases, says Dr Chris Weldon from the University of Pretoria. This follows research by a PhD student in the Department of Zoology and Entomology to distinguish flies of the same species.

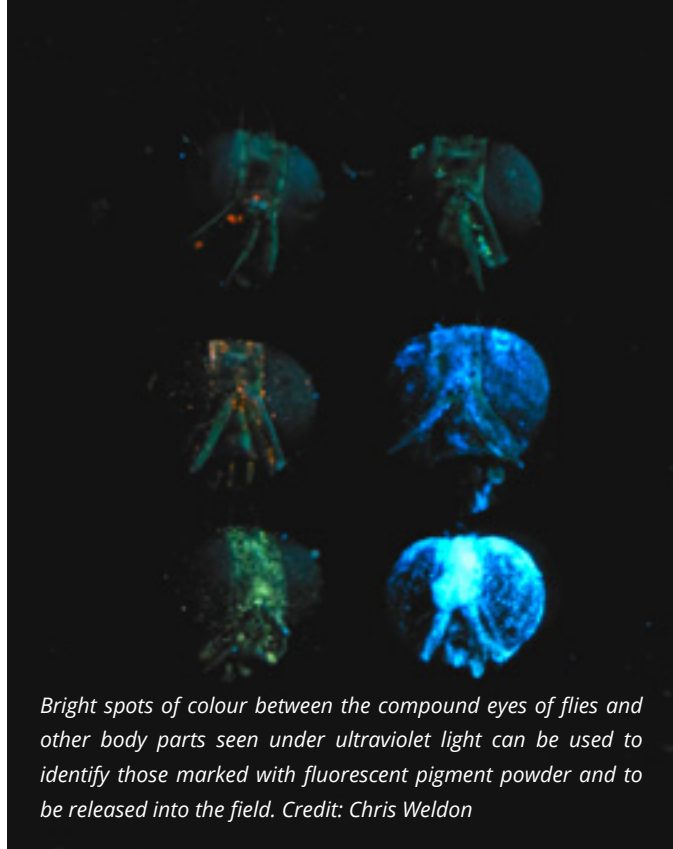
To many people, one fly looks much like another, but the correct identification of fruit flies in traps is important for monitoring infestation risk of fruit grown commercially. For scientists performing field experiments on pest fruit flies, or releasing sterilised insects for sterile insect technique (SIT) programmes, it is even more important to correctly identify flies that have been released.

Louisa Makumbe, a PhD student in the Department of Zoology and Entomology, investigated the possibility of telling one fly apart from another of the same species. She focused on the highly invasive oriental fruit fly (*Bactrocera dorsalis*) and obtained commendable results, which have now been published in the journal *African Entomology*. Her research was funded by Citrus Research International, Hortgro Science and the South African Table Grape Industry.

Makumbe set out to optimise the application of fluorescent pigment powders to effectively mark the oriental fruit fly. This is the most commonly used method for marking pest fruit flies. The pupae are covered with the fluorescent dust. It coats emerging adults. After the flies have groomed themselves some pigment is retained between their compound eyes. When viewed under ultraviolet light, the brightly glowing spot between the eyes can easily identify marked flies. The best colour and dose of powders have already been studied and determined for some fruit flies, such as the Mediterranean fruit fly. However, there was no information available for the oriental fruit fly in this regard. Owing to this, she set out to optimise the application of fluorescent pigment powders to effectively mark it.

Makumbe began by running laboratory tests on how different doses (0, 2, 4 or 6 g/l of pupae) of pink, orange, green, yellow, blue and “invisible blue” (a light yellow powder that glows blue under ultraviolet light) affected adult emergence, survival, and the visibility of marks. She found that dose had no effect on adult emergence, and survival to 28 days was actually higher in marked flies than unmarked ones. The different colours had no effect on the number of flying adults or survival to 28 days. Visibility of marks was above 90% for up to 14 days, and then gradually decreased. Pink and orange marks were the most visible after 28 days, with approximately 80% of flies retaining marks in these colours.

The laboratory results were then verified under field conditions. Makumbe placed flies marked with doses of 0 or 2 g/l in sleeve cages



Bright spots of colour between the compound eyes of flies and other body parts seen under ultraviolet light can be used to identify those marked with fluorescent pigment powder and to be released into the field. Credit: Chris Weldon

on a loquat tree to assess their survival and mark visibility were. Pigment concentration and colour had no effect on survival or mark visibility. High levels of mark visibility were retained for only seven days before declining to an average of 67% by 28 days after adult emergence.

These results show that all tested fluorescent pigment powder colours may be applied at 2 – 4 g/l of pupae to mark adult oriental fruit flies. Although pigment marks were lost over time, this is fortunately not a major problem in SIT programmes where millions of sterile flies are released weekly and few flies are recaptured after two weeks of release.

Makumbe's work is therefore a positive start to studying oriental fruit flies in the field and the potential future development of their control using SIT in South Africa.

These results are published in full in: Makumbe, L. D. M., Manrakhan, A. and Weldon, C. W. (2017). Optimisation of fluorescent pigment marking for Bactrocera dorsalis (Diptera: Tephritidae). African Entomology 25: 220-234.

For more information, contact Dr Chris Weldon, Department of Zoology and Entomology, University of Pretoria: cwweldon@zoology.up.ac.za



The oriental fruit fly is highly invasive and now found in the north-eastern parts of South Africa. Credit: Nina Parry

Raindrops have been falling since 3229 million years ago

Can a raindrop be fossilised? Unfortunately not! Fossilised raindrops would give us a plethora of information about prehistoric atmospheres, but raindrops evaporate, desiccate or percolate into the ground if they do not run-off and drain into rivers, lakes and finally oceans.

Raindrop points of impact on wet muddy ground, however, can be preserved and such fossil raindrop imprints or “craters” are known from many places and from all geological epochs of Earth history, including the Archean eon, 2,5 to 4 billion years ago.

As geologists love to drill, yet another International Continental Drilling Project (ICDP) is planned in South Africa. In October 2016, a field workshop near Barberton, one of the world's oldest geological sites, was organised by Prof Christoph Heubeck from the University of Jena, Germany (a regular visitor to UP Department of Geology). Guests of the Kumba-Exxaro Chair at the Department of Geology, gave a seminar to our honours students and subsequently took part in this workshop. Prof CH Heubeck and Prof R Mazumder (from the Australian Curtin University in Sarawak), Dr D Fernandez-Remolar from Luleå University of Technology, Sweden and Dr Mehrnaz Siahi, a postdoctoral research visitor to UP from Iran and the LMU Munich, Germany were among approximately 60 international workshop participants planning a new adventure for fresh, unweathered rocks.

A glimpse of the world's most ancient raindrop imprints found on a mudcracked rock surface in the Moodies Group of the Barberton Greenstone Belt (taken by Tyler Robinson)



Prof Wlady Altermann

During a field trip of the ICDP workshop, led by Dr Martin Homann from the European Institute for Marine Studies, Brest-Iroise, Tyler Robinson, a geologist now with VTN Mining at Barberton and former student of Prof Altermann at UP (honours 2014) found a sandstone slab with a mudcracked shale layer on which Prof Wlady Altermann, Head of the Department of Geology identified some circular and elongated depressions, 2-3 mm in diameter, representing fossilised raindrop imprints. An interbedded volcanic ash layer in these outcrops, has been previously dated at 3229 ± 15 million years (Stutenbecker, 2014). Thus these fossil raindrop imprints represent to-date the world's oldest evidence of atmospheric precipitation and make yet another superlative from the geology of the Barberton-Makhonjwa Mountains, pushing the record by c. 500 million years back towards the origin of the Earth. The previously oldest known raindrop and hail imprints were also found in South Africa, in Griqualand West, and were described by several researchers from the ca. 2780 million years old T'Kuip section of the Ventersdorp Supergroup (van der Westhuizen et al., 1989; Altermann and Lenhardt, 2012; Som et al., 2012).

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A bright future for SAAFoST's Food Product Development competition winners

In October, Food Technology and Food Science students from the University of Johannesburg, Tshwane University of Technology, the University of Venda and the University of Pretoria (UP) gathered on UP's Hatfield Campus for the annual Student Food Product Development finals of the South African Association for Food Science and Technology (SAAFoST) northern branch.

Experienced judges observed, tasted and interviewed participants about their entries. Projects were evaluated based on science applied, display and commercial potential. Later, students were each given two minutes to pitch their new products to the audience, which included industry representatives and talent seekers.

Food product development forms part of the curriculum for Food Science and Food Technology study programmes at all four universities. However, each institution addresses it differently in terms of scope, theme, structure and focus. Winners were announced for each of the universities. At UP, team WAFFIBS – consisting of BScHons (Food Science) students Kgomotso Dhlamandhla, Dewald Uys, Anton Venter and Adèle Neethling – walked away with the top prize, earning R1 000 each, sponsored by SAB ABInBev. WAFFIBS is a novel, guilt-free, high-fibre ice cream cone utilising barley fibre as a main ingredient. Runners up Crunchie Munchies (Gosiame Phaladi, Belinda Bevis, Lerato Malesa and Adri du Plessis) developed a high-fibre, healthier alternative to current chocolate snacks. Third prize was scooped up by Ursula Bothma, Jillian Oosthuizen, Camagwini Makapela and Danielle Gemeliaris with their B-Fast breakfast biscuit.

Anton Venter, Adèle Neethling, Dewald Uys, Ms Ingrid Woodrow (Chair SAAFoST northern branch), Kgomotso Dhlamandhla and Mr Can-See Masilela of SEDA (Photo: Jané Marais)



From grains to produce – the PMA experience

Jean-Pierre Nordier and Dipuo Boshomane, both final-year Agricultural Economics students from the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria (UP), had the opportunity to attend the 2017 Career Pathways programme of the Produce Marketing Association (PMA) Centre for Growing Talent. The event, which they attended with 36 other students from around the world, was held in New Orleans, USA, and lasted five days, starting on 17 October.

The programme is designed to attract and expose the best and brightest university students from across the world to the global fresh produce and floral industries.

The first three days of the programme included various educational workshop sessions. During their studies at UP, Nordier and Boshomane had been exposed to various disciplines spanning food science, plant production, economics and marketing. This background provided many opportunities for them to engage inquisitively with the global leaders in the fresh produce and floral industries who chaired these sessions. Moreover, these sessions prepared them for meaningful interactions with exhibitors on the expo floor.

To enhance their experience, Nordier and Boshomane were assigned career ambassadors Justin Chadwick, CEO of the Citrus Growers' Association of Southern Africa, and Adolf Kieviet from Freshworld, who connected them with other industry members and patiently walked the expo floor with them while answering their many questions.

One of the highlights of the programme was the opening of the South African Department of Trade and Industry's booth on the PMA Fresh Summit expo floor. During the opening, the two students had the privilege of meeting Ambassador Mninwa Mahlangu and other South African industry leaders. This event was evidence of the growing opportunities for the South African agricultural industry, and they could not have been prouder to be part of it.

Their experience at the 2017 PMA Fresh Summit Convention and Exposition will doubtless contribute to their success as future practitioners in the South African agricultural industry.

Nordier and Boshomane are grateful to Monsanto South Africa, and especially to managing director Mr Kobus Steenekamp, for their generous sponsorship, without which this fantastic learning opportunity would not have been possible.



The 2017 PMA Fresh Summit Expo floor



University of Pretoria and University of Stellenbosch at PMA, from left: Dipuo Boshomane, Rimelda Matiwane, Cildie van der Walt and Jean-Pierre Nordier



Staff and students from Consumer and Food Sciences decorating shoeboxes for the Santa Shoebox Project

Consumer and Food Science supports Santa Shoebox Project

'What did you do for Mandela Day?'

The departments of Consumer Science and Food Science did not wait until they were formally merged into one department* before they started working together. For the second year in a row, the postgraduate and undergraduate students, along with many of the staff, spent their 67 minutes covering and decorating shoeboxes for the Santa Shoebox Project (www.santashoebox.org.za).

The Santa Shoebox Project is a national charity that collects and distributes shoeboxes, each containing basic items (toothpaste, a toothbrush, soap, a facecloth, an outfit of clothing, educational supplies, sweets and a toy) to more than 1 000 child care facilities throughout South Africa and Namibia – many of them in rural areas.

Special thanks are due to the Consumer Science Textile students, who made over 100 outfits of clothing for our boxes, and to staff and students of the two departments who rose to the challenge of

collecting all the other items required to fill the boxes. The aim was to match and possibly exceed our target of 69 boxes, which was the combined total of the two departments last year. Through the overwhelming generosity of staff and students alike, an amazing 102 boxes will be donated this year. The team of enthusiastic box packers were able to pack all the shoeboxes in less than an hour.

The Department of Consumer and Food Science would like to challenge other departments in the Faculty to use their 67 minutes for Mandela next year to wrap shoeboxes and join the Santa Shoebox appeal. There are so many children in need and together we can help them.

*The departments merged from 1 November 2017 to become the Department of Consumer and Food Science in the Faculty of Natural and Agricultural Sciences.

PMA invests in future of Agricultural Economics students



Jodie Vosloo and Koketso Mokoditso

As the University of Pretoria's top Agricultural Economics students in 2016, Jodie Vosloo and Koketso Mokoditso had the privilege of attending the Career Pathways programme.

The programme is hosted by the Centre for Growing Talent of the Produce Marketing Association (PMA) and funded by AgriSETA as well as sponsors and donors of the Centre. It coincided with the annual PMA Fresh Connections Conference and Trade Show in Cape Town in August 2017. The aim of the Career Pathways programme is to create opportunities for the brightest minds at selected universities around the country to rub shoulders with notable members of the fresh produce industry.

In the interest of learning, the two students attended keynote addresses, career panels and workshops to broaden their knowledge on the challenges and opportunities faced by the fresh produce industry. Vosloo and Mokoditso felt privileged to

have Mr Anton Kruger of the Fresh Produce Exporters Forum, and Mr Piet Prinsloo of ZZ2 as their respective mentors. These mentors were always ready to answer pertinent questions and introduce the students to influential industry leaders. They also had the opportunity to network with both young and experienced professionals in leadership positions in the fresh produce value chain. These and other networking opportunities helped them gain valuable soft skills in networking and communication, which are very useful when pursuing a career as an agricultural economist.

This experience heightened the students' passion for South African agriculture and they are eager to begin fruitful careers in the sector.

Vosloo and Mokoditso said they are grateful to the PMA Centre for Growing Talent and its members who are willing to make investments in students' futures.



Junior A – Nadia Fourie, Casper-Hugo Pelser, Zerwick de Lange, Elani Smith, Adriaan du Toit, Dalen Lombard, Lethabo Masenya, Chetanya Bansal, Shuaib Nuruddin and Jason Chung

UP supports SA Mathematics team competition

The South African Mathematics team competition of the Actuarial Society of South Africa (ASSA) took place during September 2017. This Olympiad-type competition, in which high-school learners compete in a team format, is organised by the South African Mathematics Foundation (SAMF), and sponsored by ASSA and Casio. The Department of Mathematics and Applied Mathematics

at the University of Pretoria (UP) is responsible for the Gauteng North region. Three junior teams (Grades 8 and 9), and three senior teams (Grades 10 to 12), of ten learners each, were entered by UP to represent the Gauteng North region. The Gauteng North Junior A team came fourth in the country, and the Gauteng North Senior A team came third in the country.



Senior A – Graham Mitchell, Mischa Kuschke, Jialiang Yu, Zian Hoek, Marnus Slabbert, Anton van Wyk, Johannes Conradie, Nian Vorster, Stephan Geyser and Klara Eybers

CGIS hosted Winter School focusing on participatory sensing

Earlier this year, the Centre for Geoinformation Science (CGIS) at the University of Pretoria (UP) hosted the 2017 Winter School on Participatory Sensing as part of the Geomatics and Participation project between UP and the Karlsruhe University of Applied Sciences (HsKA) in Germany.

The project is funded by the Baden-Württemberg Stiftung under its programme, the Baden-Württemberg-Stipendium for University Students, which aims to bring students from the technology and innovation region of Baden-Württemberg together with students from South Africa to gain experience and knowledge regarding real-time geomatics. An MoU was signed between HsKA and UP in 2016.

The 2017 Winter School was officially opened by Dr Lisette Andreae, Head of Science and Education at the German Embassy in Pretoria, and by Prof Jean Lubuma, Dean of the Faculty of Natural and Agricultural Sciences at UP.

According to Prof Serena Coetzee, Director of the CGIS, 'seven students from HsKA visited UP for the 2017 Winter School, and were joined by seven BScHons (Geoinformatics) students from UP associated with the CGIS. On the first evening, the guests were welcomed to South Africa with beers and burgers at Capital Craft Beer Academy. From the start, the students from the two universities engaged in lively discussions, not only about geoinformatics, but also about their different food and music preferences.'

The Winter School programme introduced the participants to the Alaska informal settlement on the outskirts of Mamelodi and to participatory mobile map applications. A number of presentations provided some theoretical background: Dr Carin Combrinck from the UP Department of Architecture inspired the students about in-situ upgrades of informal settlements and townships; her honours students presented the maps that they use for their urban design projects in Mamelodi; Nina Honiball from the UP Department of Family Medicine shared her experiences about participatory mapping with community health workers in the City of Tshwane; Dr Nerhene Davis from the Department of Geography, Geoinformatics and Meteorology introduced the students to the challenges faced by developing cities; and Derrick Kotze from mLabs guided them on the development of participatory mobile map applications.

Prof Coetzee explained: 'The students developed three mobile apps. With the first app, users can map locations of environmental hazards, such as open wiring; the second app records locations of community gathering points, useful for planning upgrades in a settlement; and the third app, a panic button, tells the community where to respond in case of an emergency. Only open-source software was used: among others, PostgreSQL with PostGIS, Geoserver, Leaflet API and Cordova. The students gained some practical skills that will prepare them for their life as geoinformatics professionals: how to coordinate work in teams, the harsh reality of life in an informal settlement and how geoinformatics applications can help those in need.'



The opening ceremony with Dr Lisette Andreae (Head of Science and Education, German Embassy, Pretoria), Prof Jean Lubuma (Dean: Faculty of Natural and Agricultural Sciences, UP); Prof Dr-Ing Gertrud Schaab (Faculty of Information Management and Media, HsKA) and Prof Serena Coetzee (Director: CGIS, UP)

The students had opportunities to socialise with visits to Freedom Park, a game reserve where some of them touched the big cats, and to one of the Park Acoustics concerts. The visitors were treated to a local braai and a potjie, and the locals tasted a home-made *Schwarzwälder Kirschtorte* (black forest cake) prepared by the German visitors. There was also time for cards, board games and frisbee, or just listening to music and relaxing together. In the blink of an eye, friendships had been forged, two weeks had passed, and it was time to say goodbye.

To see what the participants blogged about the Winter School, visit <https://bwsgeomaticsandparticipation.wordpress.com/>.

Baden-Württemberg-Stipendium

The Baden-Württemberg-Stipendium supports the international exchange of students and vocationally qualified people/young professionals. Since 2001, it has enabled more than 20 000 young people from Baden-Württemberg to spend some time abroad and allowed scholarship holders from other countries to get to know Baden-Württemberg. Each year more than 1 000 young people receive a Baden-Württemberg-Stipendium.

www.bw-stipendium.de

Baden-Württemberg-Stipendium for University Students

Through the Baden-Württemberg-Stipendium for University Students, the Baden-Württemberg Stiftung supports innovative joint projects between universities from Baden-Württemberg and their international partners. The programme, which provides funding of around €800 000 per year, began in 2011 and since then has supported more than 50 projects.

Baden-Württemberg Stiftung

The Baden-Württemberg Stiftung advocates a vital Baden-Württemberg with a high quality of life. It helps pave the way for top-class research, many kinds of educational measures and responsible dealings with our fellow men. The Baden-Württemberg Stiftung is one of the major foundations in Germany, and the only one which invests exclusively and without partisanship in the future of Baden-Württemberg, and thus in the future of its citizens.

www.bwstiftung.de

Four successful Biomathematics events hosted

The Mathematics Department was abuzz with excitement from 22 to 23 June 2017. With several overseas visitors to UP being present, four Biomathematics activities were held.

First, a Biomath Forum Lecture took place on the Prinshof Campus on 22 June. The speaker was Prof Leon Glass (McGill University, Canada). The title of his lecture was "Predicting the risk of sudden cardiac death".

The second activity was a postgraduate student competition, "Thesis in 3". The competition required students to condense their research into a three-minute, one-slide presentation for non-specialist audiences. This was held on the afternoon of 22 June, and adjudicated by the overseas visitors. Rebecca Bekker was the winner

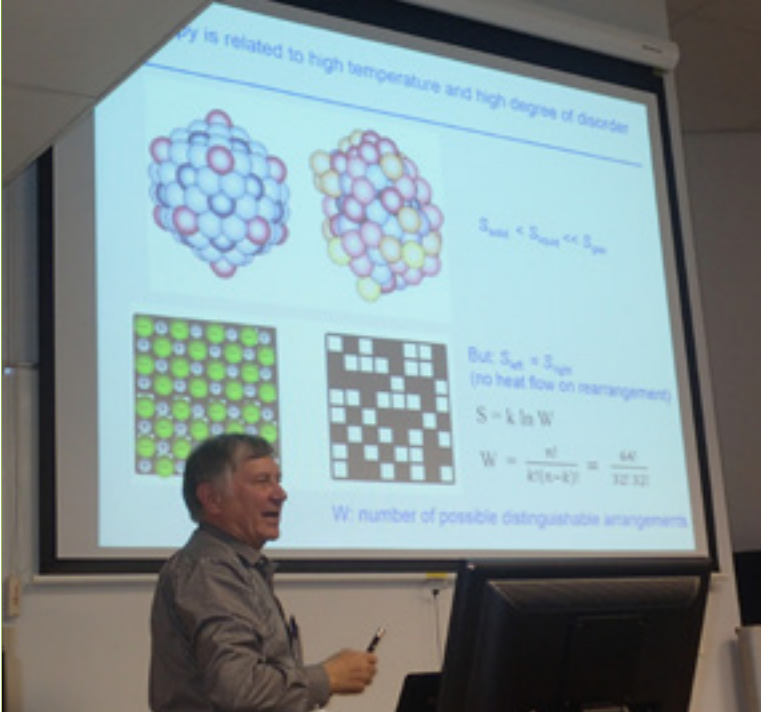
of the competition, with David Arogunjo, Phindile Dumani and Yash Madanha as runners-up. However, Emmanuel Amikiya was the audience's choice

An open colloquium by the Department of Mathematics was third in line. The speaker was Prof Peter Hinow (University of Wisconsin-Milwaukee, USA). The title of his talk was "*Linear stability of delayed reaction-diffusion systems*", and took place in the late afternoon of 22 June on the Hatfield Campus.

On the closing day, 23 June on the Hatfield Campus, a Biomath Forum Lecture was delivered by Prof Peter Rashkov (Institute of Mathematics and Informatics, Bulgaria), titled "*Nontrivial dynamics in the dual phosphorylation-dephosphorylation cycle*".

Prof Jean Lubuma (Dean of the Faculty of Natural and Agricultural Sciences) with Ms Rebecca Bekker





Interdisciplinary spring course on solar energy and photosynthesis

The Department of Physics hosted a highly successful postgraduate interdisciplinary course on solar energy and photosynthesis at the University of Pretoria (UP) during the October recess. This unique course, which was presented for the first time in South Africa, attracted student participation from six different departments at UP – Physics, Chemistry, Genetics, Microbiology, Plant and Soil Sciences, and Mechanical and Aeronautical Engineering. Although the course was intended mainly for UP students, two students from the University of the Witwatersrand and one from CEA-Saclay in France also participated.

The broad course topic was investigated from various angles, aligned with the expertise of the lecturers, who are based in the Departments of Physics (Tjaart Krüger, Mmantsae Diale and Michal Gwizdala), Chemistry (Shankara Radhakrishnan and Emil Roduner) and Genetics (Steven Hussey and Eshchar Mizrahi), giving the course a true cross-disciplinary flavour. The University also welcomed a number of leading international scholars as guest lecturers: Rienk van Grondelle (Department of Biophysics, Vrije Universiteit Amsterdam, the Netherlands), Emil Roduner (Institute for Physical Chemistry, University of Stuttgart, Germany), and Bruno Robert and Diana Kirilovsky (both from the Institute of Biology Technologies, CEA-Saclay, France). Van Grondelle, Roduner and Robert presented well-attended public lectures on stimulating topics at Sci-Enza (the University's science centre). The French Embassy in South Africa funded the visits of the French scholars by way of the Protea Research Programme and is also generously sponsoring the best student for a research internship in France.

After starting the course with a brief introduction to the quantum-mechanical basis of light-matter interaction, the in-depth workings of various photosynthetic organisms and numerous types of semiconductor and chemical solar cells were explained. Strategies for redesigning photosynthesis were discussed on the last day, based on the principles of synthetic biology and bioengineering. Finally, Kittessa Roro from the CSIR Energy Centre enlightened attendees with a bird's view on the South African solar industry. Several students indicated that the multidisciplinary focus of the course was the most valuable aspect for them.

A range of assessment activities took place during the lecture week, all of which were based on preparatory activities during the weeks preceding the course lectures, in a typical flipped class style. All participants were required to study a collection of research papers and articulate one non-trivial question per paper. Each question was to be answered by two other students. This level of preparation encouraged the active participation of all students. The questions and answers were then discussed and evaluated during the various discussion sessions. The international guest lecturers were the leading authors of some of the research papers published in top-ranked scientific journals such as *Nature* and *Chemical Society Reviews*. Each student was also assigned the task of summarising and critically evaluating two research papers by means of a short presentation in the presence of all participants as well as in the form of a written report. This activity was aimed at improving their work readiness, as well as improving their scientific communication skills, which are some of UP's graduate attributes. All students enthusiastically took part in these activities and the international experts were impressed by the high level and active engagement of the students.

Within a few weeks after announcing the course in a few departments at UP, the limit of 30 student participants was reached. This relatively small number enabled active interaction among all participants. The level of interest in the course emphasises the demand for multidisciplinary courses at UP and provides impetus for making this particular course an annual event. The organisers are also considering broadening the scope of the course to include system and cost analysis of new technologies in the solar industry, which could attract more engineering students.

Almost without exception the student participants mentioned that they wished they had the opportunity to take this course for credits, for example as part of their bachelor's degree. As the Physics Department is currently the only department in the Faculty of Natural and Agricultural Sciences offering postgraduate elective modules, the organisers appealed to other departments to seriously consider crafting strategies to enable and encourage multidisciplinary courses in their departments. Multidisciplinary research is the future and UP can and should take a lead to drive South Africa towards this goal.

Mathematics Midwinter Morning at UP

The *Mathematics Midwinter Morning* held on 25 August 2017, was once again a success. The speaker, Martin Sanne from the CSIR, spoke about what he called “The next industrial revolution”.

He discussed the disruptive changes taking place in the world-wide environment, including the global manufacturing industry, and how this phenomenon requires a strategic response that represents a clean break from the past. He explained that the “business-as-usual” approach will not enable South Africa to catalyse the re-industrialisation of South Africa in order to reach its strategic regional and global ambitions.

He concluded that disruptive emerging technologies are changing the face of manufacturing world-wide and present an opportunity for our industry to achieve exponential improvement. This “exponentiality” is capable of solving the major challenges faced by society, while achieving objectives that could not previously be achieved in the areas defined by the country’s National Development Plan (NDP) – financial and economic growth, creating employment, transitioning to a low-carbon economy, improving health, expanding infrastructure and building safer communities.

Martin’s audience found the talk inspiring and insightful and were optimistic about the way forward.



Mr Martin Sanne

NAS celebrates Heritage Day

The Faculty of Natural and Agricultural Sciences (NAS) Transformation Desk celebrated Heritage Day at Uitspan this year. The photograph shows some staff members in traditional outfits.



6th edition of *Finance and Farm Management* launched

The 6th edition of the book *Finance and Farm Management* was launched earlier this year at the University of Pretoria (UP).

This publication has become very prominent from an academic and farmer's point of view, as it combines theory and practice and covers a broad spectrum of subjects in farm management and finance.

Prof André Louw, incumbent of the Chair in Agribusiness in the Department of Agricultural Economics, Extension and Rural Development was chief editor with Dr Mariette Geyser, currently a farmer and formerly a lecturer at the University of Pretoria, the co-editor. Prof Louw was the author of the first book since it was published in 1981 for the first time and the book has been sponsored by Standard Bank since the first edition.

The purpose of this book is to provide certain finance, business and farm management skills required in a rapidly changing and challenging world. As quoted in the first chapter:

"The modern farm business and agribusiness operate in a complex, profoundly interconnected and rapidly evolving domestic and global environment, largely unrecognisable from just a few decades ago. The pace and frequency of change in this increasingly globalised, highly competitive landscape emphasises the need for a shift in the mind-set of the agricultural businessman away from a linear, static and inward focus to the development of management strategies and tactics that are flexible and adaptable to new developments, challenges and unforeseen opportunities."

The main focus of the book is financing in agriculture and includes chapters on business planning, financial management, budgets, investment decisions and risk management. All current chapters have been upgraded and new chapters have been added. The ones added are on Value and Supply Chains in Agriculture, Entering African and other international Markets and on sources of finance. Significant upgrades were done on Tax Planning for Farm Businesses and the Strategic Focus on BEE.

The target markets of the book are agri-students, agriculture producers and agribusiness practitioners. Currently the book is also prescribed by most universities teaching Agricultural Economics in South Africa.

From left: Dr Melissa van der Merwe (UP), Prof Andre Louw (chief editor), Ms Lindie Stroebe (General Manager: PMA), Ms Keneilwe Nailana (Standard Bank), Mr Struan Garland (UP), Dr Danie Jordaan (UP), Dr Mariette Geyser (co-editor, farmer and former UP staff member) and Prof Charles Machethe (Acting Head: Department of Agricultural Economics, Extension and Rural Development, UP).





From left: Prof Loyiso Nongxa (University of Witwatersrand), Prof Kerstin Jordaan (UNISA), Dr Danie Uys (President: South African Statistical Association) and Prof Jean Lubuma (UP).

Collaborative project launched to improve Mathematics and Statistics in SA

A Teaching and Development Grant (TDG) to strengthen academic staff development in Mathematical and Statistical Sciences in South Africa was recently launched at the University of Pretoria. This national collaborative project is supported by the Department of Higher Education and Training.

The University of Pretoria is the lead university with the Dean of the Faculty of Natural and Agricultural Sciences, Prof Jean Lubuma as the Project Coordinator. Besides the South African universities that are partners in this collaborative project, the Department of

Science and Technology (DST) / National Research Foundation, Centre of excellence in Mathematical and Statistical Sciences (MaSS), the South African Statistical Association (SASA), the South African Mathematical Society (SAMS) is also closely involved.

According to Prof Lubuma, "This intervention is of valuable importance to produce highly trained manpower in the critical area of mathematical and statistical sciences. The University of Pretoria considers this role as an honour and will do all in its power to support the other role players.



From left: Prof Ferdi Meyer, Dr Holger Matthey, Ms Tracy Davids, Dr Mmatlou Kalaba, Mrs Lulama Ndibongo-Traub and Prof Patrick Westhoff

BFAP Baseline 2017 launched at UP

On 2 August 2017, the Bureau for Food and Agricultural Policy (BFAP) launched the 2017 edition of its annual baseline – a 10-year outlook for South African agriculture at the University of Pretoria. The BFAP has developed a firm reputation of delivering upon its commitment to inform and support decision makers in government, industry bodies, NGOs, and the private sector, and the event attracted more than 200 people.

The BFAP indicated that the South African agricultural and agro-processing industries are currently facing a mixed bag in terms of current and future prospects. Following the severe drought of 2015 and 2016, it is clear that despite the all-time record harvests being achieved for maize and soy beans in the current season, the recovery from the drought in the summer rainfall region will take more than one season. This is especially true in the livestock sector, where herd numbers will have to be rebuilt and a recovery in pasture quality takes time. While the summer rainfall regions are at different stages of recovery, the situation in the Western Cape remains dire with major long-term impacts due to severe restrictions on the availability of water for irrigation of high-value export industries.

Looking ahead, the outlook for the South African agricultural sector must be seen in the global context. Food prices are one of the key drivers of food security in the country. The recent drought has had a major impact on the affordability of staple maize, with the cost of a single serving of maize meal increasing by 43%, while the cost of

the staple food basket increased by 22%. The good news is that the rate of staple food price inflation is projected to decline by 16% on the back of the improved weather conditions and the appreciation of the exchange rate. Yet, this rate is measured from a higher base and therefore, in absolute terms, staple food prices remain high.

In terms of the broader food system, the main concern over the outlook period remains the slow economic growth rate and unemployment. In terms of class mobility, South Africa has managed to reduce the percentage of the population living in the low-income brackets (LSM 1-3) from 32 percent to 8 percent since 2005. This has not only boosted the overall demand for food, but also led to a dietary change. However, this class mobility rate has declined significantly and over the next ten years the growth rate in the demand for food is projected to slow down considerably.

The BFAP is a virtual network, linking individuals with multidisciplinary backgrounds to create a co-ordinated research system that informs decision making within the agricultural food and beverage system of South and Southern Africa. The core analytical team consists of independent analysts and researchers who are affiliated with the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria, the Department of Agricultural Economics at the University of Stellenbosch, and the Directorate of Agricultural Economics at the Provincial Department of Agriculture, Western Cape.

NAS launches Transformation Desk

The Faculty of Natural and Agricultural Sciences (NAS) officially launched the NAS Transformation Desk in August this year.

The theme was 'Transformation is everybody's business' and the event was jam-packed with many presentations. Prof Jean Lubuma, Dean of the Faculty of Natural and Agricultural Sciences officially opened the event with a welcome address. Prof Tinyiko Maluleke, Advisor to the Vice-Chancellor and Principal elaborated on the ten principles of transformation. Prof Vinesh Maharaj, Head of the Department of Chemistry and Faculty Representative to the Institutional Transformation Committee addressed intervention through curriculum transformation. Prof Edward Webb, Deputy Dean: Research and Postgraduate Studies in NAS, focused among

others on how research can be transformed and emphasised that transformation is more than merely changing demographics. Prof Mmantsae Diale from the Department of Physics' presentation was dedicated to diversity and inclusivity in the Faculty.

Undergraduate and postgraduate students also had the opportunity to share their experiences on transformation while Ms Nontando Radebe from Human Resources (HR) addressed transformation with regard to HR policies. Perspectives from two academic departments, the Department of Statistics and the Department of Consumer Science were shared, while Mr Jacques Marneweck from the Experimental Farm gave insight on how support services staff perceive transformation.

Prof Jean Lubuma and Prof Tinyiko Maluleke

